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The Income and Property Tax. By WILLIAM FARR, Esq., M.D., F.S.S.

I.

A CERTAIN number of things in the United Kingdom possess value ; and, because they belong severally to the inhabitants, are called Property. Property is constantly changing—acquiring and losing value. When its forms are multiplied, the resulting value is called produce ; of which agriculture offers the most familiar examples in fruits, grain, and stock. Here is an increase in the number of things of which the property consists. Thousands of grains of wheat, of blades of grass, of the young of sheep, oxen, and horses, are created, in which value is incarnated and visible. Produce appears also in another form ; the increase is in the quantity or characteristic quality of the matter of which each thing of value is constituted ; as when lambs, calves, colts, grow gradually, into sheep, oxen, horses. If you take their value at the beginning and at the end of the year ; you find that although their number has decreased by death for instance, their value has increased : it will go on increasing for months, or for years. The increase in value is indicated, but not measured, by the increase in the number or bulk of the products ; for crops of twice the average quantity will not sell for twice the average sum. The value is measured by money ; by coins of gold and silver, or by any other thing of which the value is, or is assumed to be, invariable for the time : the difference in the amount of money for which either the things proceeding from the property, or of which the property is composed, will sell, is the produce. The forms of produce then are various. Thus, if a stock of horses is worth 5,000*l.* on the first day of the year, and 6,000*l.* on the last day of the year, while 2,000*l.* have been realized by sales during the year, the produce of the stock is $1,000\textit{l.} + 2,000\textit{l.} = 3,000\textit{l.}$ Or if a horse-dealer has a young horse worth 20*l.* ; the services of the horse in the year yield 16*l.*, and at the end of the year it will sell for 35*l.*, the annual produce of the horse is $10 + 15 = 25\textit{l.}$ At a given age the animal attains its maximum value ; and the hire of its services constitutes

the whole of the produce. Such is the nature of the produce of property in living animals, which may be taken as the type of all property.

Produce then is expressed by the value in money which the property yields during the year, either in separate products, in the increase of value, or in the price of its services. The income of a lawyer, a doctor, a clergyman, a merchant, or a tradesman, is in this sense as much produce as the proceeds of a farm; it is the money value of his services, and of the services of all the instruments and agents in his possession. But anything which yields produce that will sell for money is property, although it may be itself inalienable; consequently, all the free labourers, artisans, professional men, of the United Kingdom, having within them this power of production, are as essentially property as the things usually designated by that name, and characterised as personal or real, movable or immovable. Exclusive of all his external property, every man is worth something.

I propose to call the property inherent in a man his *Inherent Property*; and all other property of which he has possession, *External Property*. All the produce of property evidently includes pre-existing value. Thus the produce of a farm includes the value of materials, of wear of stock, of labour, and skill which have been expended in its production; so, also, do the proceeds of a manufactory, a shop, a mercantile concern of any kind, a class of professional men. The difference between the value of the produce and its cost is profit, which is consequently increase of value. When the cost exceeds the value of the produce, the result is designated loss; and although this negative quantity is the result of innumerable transactions, the aggregate result of the enterprises which are carried on is profit; as the value of all the property in the hands of man increases, and, after replacing the value of inevitable labour, leaves a surplus at his disposal for his enjoyment, gratification, and delight.

The interest of money in perfect security is the expression of this profit, at any given time, in any given country. And the rate of net profit now in England is, I conceive, nearly expressed by 3 per cent. per annum. The rate of profit, in the popular sense, is much higher; but in that sense the word can scarcely be used with advantage in science. A merchant having capital engaged in commerce, has a surplus in the produce of the year; and sometimes mistakes for the profit of his *Capital* this produce *minus* the current expenses of the year; whereas the profit of the capital is only obtained by a further deduction of a premium for insurance on the property, and of the wages of his industry; the wages, as I shall immediately show, consisting also of produce—that is, partly of the increase of the property which is invested in the nurture, education, and professional training of the class to which he belongs, and partly of a portion of that property. Profit in this vague sense may be at the rate of 5, 10, 20, 100, or 1,000 per cent. on the *stock*—that is the external property—which is engaged in the business, trade, or profession.

The interest of capital, which is property in a particular form, can invariably be resolved into two, if not three, variable elements—the profit, the premium of insurance against loss, and the reward of skill, in some cases, of making investments. The latter element may for the moment be left out of consideration. Then, if 3 per cent. is profit, 2 per

cent. covers common risks of loss; hence 5 per cent. is in England a common rate of interest on engaged capital. No foreign Government can now borrow any large sum of money at a rate of interest lower than 5 per cent.; the 2 per cent. being, I conceive, the premium of insurance against loss of profit and capital. Property exists in an infinite variety of forms: thus, there is property in land, in houses, in railways, in canals, in mines, in metals, in manufactories, in fisheries, in stock in trade, in farm stock, in the bodies of the industrial classes. The specific produce of each kind of property varies infinitely in amount; and the proportions in which profit and pre-existing capital enter into the various kinds of produce also vary infinitely. These quantities and proportions fluctuate from year to year in different classes of property; but, on the average, the rate of profit on every kind of property is equal. For if property of any kind yields a profit above the average, it is by a transfer of capital produced in larger quantities, until the price is reduced so as to leave only the average profit; and conversely. It is true that the quoted rates of profit on every kind of investment, as well as the rates of wages in different trades, and the prices of commodities from year to year, vary. But these rates must not be confounded with the actual profits realized. The Portuguese Four per Cents. are quoted at $40\frac{1}{2}$, the Spanish Three per Cents. at 49, English Three per Cents. (Consols) at $100\frac{1}{4}$ in the "Times" of to-day (January 12); and the rate of interest on investments in these three stocks will, therefore, be 10, 6, and 3 per cent. respectively; besides the value of the chance of being paid off when Spanish and Portuguese stocks are at par. What the actual result of a single investment in each of the stocks may be it is impossible to say; but it will probably be found, if the profit of all the investments which have hitherto been realized in the three kinds of stocks is ever investigated, that the balance is not on the side of the stock on which either 10 or 6 per cent. interest is promised.

No constant relation exists then between the value of property and of produce, or between stock and the nominal rates of interest; but there is, in every kind of property, on a series of years, a steady relation between property and profit.

A large quantity of the property of the country—such as furniture, jewels, the precious metals, cash, pictures, parks—is often called unproductive; but, I apprehend, erroneously. All these things have been purchased with money, and may again be converted into money, the representative of capital, which can always be invested productively; and if, instead of investing 10,000*l.* in land, which would produce 300*l.* a-year, you invest it in furniture, pictures, or jewels, it is evident that you select this investment because property in such a form yields services which you esteem at a higher value than 300*l.* a-year. These services are products; and the property is, therefore, productive. When an object ceases to be serviceable, and ceases to be exchangeable for value, it ceases to be property, and at the same time ceases to be productive.

The Income of the year taken generally is the sum of the year's Produce; which, it will be recollected, consists partly of profit and partly of pre-existing property; and while the *Incomes* of some of the 28 millions of people in the United Kingdom are almost entirely profit, the incomes of others consist entirely of pre-existing property.

This Income is expended by each member of the state—(1), individually—in families; (2), in voluntary associations for specific purposes, such as clubs, societies, colleges, commercial companies; (3), in townships, parishes, boroughs, counties, on local purposes, or in what is sometimes called local government; and (4), in his collective capacity as a member of that great society—to use Aristotle's designation—the *State*. The ordinary revenues and extraordinary resources constituting the public *Income* of the United Kingdom for the year ending January 5, 1852, amounted to 56,834,711*l.*; of which 56,271,257*l.* are called in the public accounts the ordinary revenue, including 378,783*l.* from the Crown lands and small branches of the hereditary revenues; 22,197,075*l.* from customs dues; 15,400,420*l.* from excise duties; 6,529,050*l.* from stamp duties; 2,422,168*l.* from the post-office; 3,789,984*l.* from the land and assessed taxes; 5,440,350*l.* from the income tax; 113,426*l.* from the surplus fees of regulated offices, &c. If we deduct the receipts from Crown lands, the public income is in the proportion of about 2*l.* a head on the population. The income tax, which has been levied annually since 1842, is less than one-tenth part of the public revenue, and less than 2 *florins* a head on the population.

The Revenue of the State is that portion of the produce which is expended in common; in the discharge of common duties, on national objects, institutions, works, achievements. The protection of the property and lives of the people is its main, but not its paramount object; for it is not, happily, the destiny, either of a State or of an individual, to expend all its energies on self-preservation.

The State, out of its revenues, has (1) to fulfil all its engagements with the public creditor, and thus to preserve the public faith inviolate—protect our honour; (2) protect life and property; (3) maintain its own existence and greatness in the political and social institutions of the country; (4) promote education, culture, art, science, and religion; (5) work out historical achievements, in which the whole strength of the nation is exerted, as it would be, for example, to repel an invasion,—acquire, as England has done, large territories, free slaves, avert wrongs, redress violations of the law of nations, found great colonies; to secure its immortality, and transmit its life as well as its glories to new nations in this and in the other hemisphere. Such are some of the purposes on which the annual revenue of the United Kingdom has been—should be expended; and to all such purposes there can be no doubt that every person who is in, or has property in that great Company, his Country, should contribute; and no more obviously just rule for determining the quota of his contributions can be laid down than this:—

That each member of the community should contribute every year to the public expenditure in a fixed proportion to the amount of Property in his possession during that year.*

For no more exact measure of his ability and duty to contribute to the public revenue can be found than the value of his property supplies. As it is the measure of the loss against which he is insured by the State, it is also the measure on which his contributions to the public Exchequer should be rated. “The subjects of every State,”

* See the Evidence taken by the Committee of the House of Commons on the Income and Property Tax, 1852, No. 510, Q. 4895—9.

says Adam Smith, in his first maxim on taxes,* “ought to contribute towards the support of the Government, as nearly as possible, in proportion to their respective abilities; that is, in proportion to the revenue which they respectively enjoy under the protection of the State. The expense of Government to the individuals of a great nation is like the expense of management to the joint tenants of a great estate, who are all obliged to contribute in proportion to their respective interests in the estate.”

This celebrated maxim of Adam Smith—even restricted as it is unnecessarily in the second clause of the first sentence—would be strictly applicable to the taxation of the kingdom, if the revenue of every subject was derived from the same source; for as the dividends of A, B, and C, in a public company are in exact proportion to their stock, their respective contributions to the common expenses is proportional as well to their dividends as to their stock; and, if a call is made, each individual contributes, without question, in the ratio of his shares—in the ratio, therefore, of his income, which it is here assumed is all derived from the same fund. If A, B, and C have incomes derived from the Three per Cent. Consols of 1,000*l.* 2,000*l.* 3,000*l.* a-year respectively, and each is taxed 30*l.* 60*l.* and 90*l.* a-year, they will be taxed equitably as between themselves, in the ratio of their respective properties, whether their stock will sell for 33,333*l.*, 66,667*l.* 100,000*l.*, or half those sums. Again, if all the incomes of the subjects of the State were of the nature of Long Annuities, which are now quoted at 6½, each individual's revenue, consisting partly of profit, but chiefly of capital, would be strictly in proportion to the value of his property, and a tax may be equitably rated either on the revenue or on the property. So if the community was represented by the persons in this society, of the same age, whose incomes were derived from a profession, they may be taxed either at an equal rate on those incomes or on the value of those incomes; and few would have any just ground of complaint. But the fact is, that the revenues of different classes of the community are the produce of different kinds of property, and the uniform tax on this produce—called *Income*—is neither proportional to the profit, property, or ability of the taxpayer. Thus, in the present year—

	£	£
A has property 33,333 in Consols; income	1,000	
B has property 6,500 in Long Annuities; income....	1,000	
C has property 15,000 in houses; income	1,000	
D has property 30,000 in land in England; income....	1,000	
E has property 17,000 in land in Ireland; income....	1,000	
F has property 10,000 in Life Annuities; income	1,000	

If the revenue expresses the value of these properties, it is evident that you might exchange the Consols for the life-annuity; if you admit that the one is more than three or five times as valuable as the other for sale, you cannot contend for a moment that it is equal to the other in levying a tax on their owners. It will be immediately seen, in conformity with the principle previously laid down, that though the incomes are the same—the produce is the same—the *Profit* is in proportion to the value of the respective properties. Thus the year's interest on 33,333*l.* in Consols is 1,000*l.*; the interest on the 10,000*l.* invested in the annuity

* Book v., c. 2, part 2.

is 300*l.*; the additional 700*l.* composing the annuity of 1,000*l.* is pre-existing capital returned. The original statute, 5 and 6 Vict., c. 35, which is popularly called the Income Tax, is not so entitled; it is "An Act for granting to Her Majesty Duties on PROFITS arising from Property, Professions, Trades, and Offices." The profit, it has been shown, is proportional to the property; and is connected with it by a constant factor, often called the year's purchase. In the execution of the Act, it is assumed throughout that *Income*—one kind of *produce*—is *profit*; that the annuity of 1,000*l.*, which, reckoning interest at 3 per cent., is valued at 6,473*l.*, is profit; that the life-annuity, including the capital invested, is profit; that the rent of houses is profit; that the income of merchants and tradesmen is profit; that the gross rent of land is profit, in the true sense—as much as the interest of money in perfect security, or the net rent of land.

The property of the country is divided for the purposes of the Act into five classes, comprehended under five schedules:—The following is an abstract of the returns for the year ending the 5th day of April, 1851.—Deduced from Par. Return, 1852, Nos. 398, 480.

A. Rent of land, houses, mines, tithes, dividends of canals, railways, gas works, other immovable property.

Incomes Assessed.		Incomes on which the Tax was Paid.		Income Tax at 7 <i>d.</i> in the £1.
£		£		£
A. 105,529,971	.....	90,570,171	.....	2,641,630

B. Profits of occupiers of land—Farmers.

Incomes Assessed.		Incomes on which the Tax was Paid.		Income Tax at 7 <i>d.</i> in the £1.
£		£		£
B. 48,023,508	.....	10,647,291	.....	310,546

NOTE.—The rent is the basis of this assessment. It is assumed in the Act that the farmer's profit is in England equal to half the rent ($\frac{1}{2}$ th rent), in Scotland ($\frac{1}{4}$ th rent).

C. Dividends and annuities payable out of any public revenue.

Incomes Assessed.		Incomes on which the Tax was Paid.		Income Tax at 7 <i>d.</i> in the £1.
£		£		£
C. 26,435,182	.....	25,583,452	.....	746,184

E. Salaries and pensions payable by Her Majesty out of the public revenue of the United Kingdom. Also some other salaries.

Incomes Assessed.		Incomes on which the Tax was Paid.		Income Tax at 7 <i>d.</i> in the £1.
£		£		£
E. 11,690,853	.....	11,366,983	.....	331,537

D. (1) Annual profits or gains to any person in Great Britain from any property whatever, in or out of Great Britain.—(2). Profits or gains from any profession, trade, employment, or vocation, accruing to any person in Great Britain. [All not included in previous schedules.]

Incomes Assessed.		Incomes on which the Tax was Paid.		Income Tax at 7 <i>d.</i> in the £1.
£		£		£
D. 65,717,048	.....	53,266,800	.....	1,553,615

The "total amount of income [called property (?) in the return] assessed," according to the heading, is 257,396,562*l.*; the income on which the tax was paid amounted to 191,434,697*l.* The returns require explanation: the tax is not levied on property in the possession of persons in Great Britain whose income is less than 150*l.* per annum; nor on the property in Ireland of any persons who reside out of Great Britain. So that we only know with any accuracy that the income of Great Britain belonging to persons who return incomes exceeding 150*l.* is at least 191,434,697. If each item were discussed, it might be shown that the incomes under these several schedules bear no constant proportion to the property, or to the profit on that property, in the possession either of the classes or individuals of whom the classes are composed. I will only notice three cases. I will take of the class C all the incomes derived from the Three per cent. Perpetual Annuities, which now return 3 per cent. interest. The man who invests 10,000*l.* in the stock of these annuities at par, obtains an income of 300*l.* a-year; and at the rate of 7*d.* in the *l.* on his income (equal .02916 in the pound on profit), is taxed 8*l.* 15*s.* annually; that is, at the rate of 17*s.* 6*d.* per 1,000*l.* on his property (.000875 in the pound on property).

There is another large class of life annuities—on equally good security. The life annuity which the same sum will purchase at the age of childhood or old age is very different: but taking the average value of an annuity on the life of every male of the age of twenty and upwards, I find that it is worth 14·951 years' purchase; consequently, 10,000*l.* on each life will purchase annuities of 668·869*l.* on an average (equal 668*l.* 17*s.* 5*d.*); the tax on which is 19*l.* 10*s.* 2*d.* annually.

Persons having incomes from several properties returning equal profits (3 per cent. interest), pay in the one case 7*d.* in the pound, in the other 15½*d.* per pound on their annual profit; or at the rate of 17*s.* 6*d.* in one, and of 1*l.* 19*s.* per 1,000*l.* per annum, in the other, on the property. Now, the greater part of the incomes under Schedules B, D, and E, are incomes derived from stock in trade, and from the professional exertions of the industrial, learned, and educated classes. I presume that no capitalist would embark at risk as a sleeping partner 10,000*l.* in any of these businesses or professions, at a rate of interest below 5 per cent. on his money, or unless, in ordinary years, his income from it was 500*l.*; because in a large number of such investments, in average concerns, the capital is lost, and in others makes no profit. The tax on 10,000*l.* so invested would be 14*l.* 11*s.* 8*d.* Stock in trade is therefore taxed at the rate of at least 1*l.* 9*s.* 2*d.* per 1,000*l.* on its value, 11½*d.* in the pound on its net profit.

It is evident that the professional income of clergymen, lawyers, medical men, mercantile men of every kind, is to them worth much less than equivalent life-annuities well secured. I mean that income which is the direct produce of services, and ceases when the ability to perform those services ceases. I have shown that life annuities, well secured, independent of services, are worth on an average fifteen years purchase (14·951), while perpetual annuities at the same rate of interest are worth 33½ years' purchase; consequently, the taxation, to be at an equal rate on the *property*, ought to be in the ratio of less than 45 to 100 on the produce—the *incomes* of the two classes.

The table to which I now direct your attention shows that the in-

comes consisting of wages are of still lower value, (see p. 42.) A whole generation of the class of agricultural labourers (males), consisting of 2,096 individuals of all ages, 1,356 adults of 20 and upwards, would be worth 303,900*l.*, on which their wages would be 14 per cent. per annum, the cost of their maintenance 9 per cent., leaving a return of 5 per cent. on the capital embarked in the living property. You must therefore deduct from the value of industrial incomes a certain amount as the value of the cost which must be incurred in obtaining the produce of the inherent property.

In practice it is unnecessary to enter into nice refinements, as all deductions from produce are allowed for in the average market value; and as we know that land, houses, stock of every kind and annuities can be valued, and are valued every day for the purposes of business and commerce, they may also all be valued for the purposes of taxation in this country, from returns more simple, and involving no more disclosure than those now in use. The principles on which simple tables may be calculated for determining and taxing nearly all the property in the country are discussed or indicated in the subsequent mathematical part of this paper.

A summary view of the operations of an Income, and of a Property Tax, on different kinds of property, is given in the annexed table. The *principle*, it must be borne in mind, is not affected by any variation in the assumed "price," "profit," or uniform "rate" of taxation.

Table (I.) of *nine* Properties of equal value, (10,000*l.*) in the hands of nine persons, A, B, C, &c.; of the estimated net profits of the several properties; of the gross income returned in the year; of the *equal taxes on each property at a given rate*, which may be raised or lowered; of the taxes on each property under the present income tax assessment.

Table (II.) of *nine* Incomes of equal amount, (1,000*l.*) during the year, in the hands of nine persons, J, K, L, &c., with the same particulars.

The whole question affecting the equity of the income tax can be discussed on these tables. Under an equitable system of taxation, the eighteen persons are assessed on the sums in the 3rd column; and at the rate of 1*l.* per 1,000*l.*, or of 2*s.* per cent. on the capital, pay the taxes in column 6.

Under the present income tax, the eighteen persons are assessed on the incomes in column 5; and at the rate of 7*d.* in the 1*l.* on income, pay the taxes in column 7.

Table (I.) may be read thus: C has long annuities worth 10,000*l.* at 6½ years' purchase; the interest or profit at 3 per cent. is 300*l.* a-year; the annuity is 1,538*l.* until 1860; the equitable *tax* is at the rate of 3*l.* 6*s.* 8*d.* per cent. on profit, or 1*l.* per 1,000*l.* on property,—10*l.*; the income tax is 44*l.* 17*s.* 2*d.*

In the nine cases, the properties are of values equal to 10,000*l.* Now persons having properties of equal value can exchange those values without loss; and as they are generally in the market, it is evident that—all other things being equal—if the *profit* was greater in one class of securities than in another, those securities would speedily rise in value until the profits were in equilibrium.

The value of property is the only infallible index to average profit, and is in all cases the true basis of equitable taxation. Here it is assumed that the profit is at the rate of 3 per cent.

Table (II.) may be read thus: M has land in England worth, at 27 years' purchase on the rental, 27,000*l.*; returning an annual rent of

A Property and an Income Tax contrasted.

TABLE I.—(The Nine PROPERTIES are of equal value.)

(1.) Nature of Property.	(2.) Price.	(3.) Value of Property.	(4.) Average Profit(?) (Net).	(5.) Gross Income, Rent, or Dividend.	(6.) Equitable Tax at the rate of £1 per £1000 on Property. 8 <i>d.</i> per £1 on Profit.	(7.) Present Income Tax of 7 <i>d.</i> in the £1.
		£	£	£	£ s. d.	£ s. d.
A. Consols.....	100	10,000	300	300	10 0 0	8 15 0
B. Consols.....	80	10,000	300	375	10 0 0	10 18 9
C. Long Annuities.....	Yrs. Purch. 6½	10,000	300	1,538	10 0 0	44 17 2
D. Land in { England.....	27	10,000	300	370	10 0 0	10 15 10
{ Ireland*.....	17	10,000	300	588	10 0 0	17 3 0
E. Houses	15	10,000	300	667	10 0 0	19 9 1
F. Railway Stock	20	10,000	300	500	10 0 0	14 11 8
G. Well-secured Life An- nuity (Age 45).....	16	10,000	300	625	10 0 0	18 4 7
H. Life Annuity at risk (Age 45).....	13	10,000	300	769	10 0 0	22 8 7
I. Professional Income (Age 45).....	11 ⁸ / ₁₀	10,000?	300?	847	10 0 0	24 14 1

TABLE II.—(The Nine INCOMES are of equal amount.)

(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)
J. Consols.....	100	£ 33,333	£ 1,000	£ 1,000	£ s. d. 33 6 8	£ s. d. 29 3 4
K. Consols.....	80	26,667	800	1,000	26 13 4	29 3 4
L. Long Annuities.....	Yrs. Purch. 6½	6,500	195	1,000	6 10 0	29 3 4
M. Land in { England.....	27	27,000	810	1,000	27 0 0	29 3 4
{ Ireland*.....	17	17,000	510	1,000	17 0 0	29 3 4
N. Houses	15	15,000	450	1,000	15 0 0	29 3 4
O. Railway Stock	20	20,000	600	1,000	20 0 0	29 3 4
P. Well-secured Life An- nuity (Age 45).....	16	16,000	480	1,000	16 0 0	29 3 4
Q. Life Annuity at risk (Age 45).....	13	13,000	390	1,000	13 0 0	29 3 4
R. Professional Income (Age 45).....	11 ⁸ / ₁₀	11,800?	354	1,000	11 16 0	29 3 4
(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)

* Irish landed proprietors residing in Great Britain pay income tax on the actual sums annually received by them in Great Britain.

1,000*l.*, of which only 810*l.* is net, after deductions for repairs, losses, &c.; the equitable tax is 27*l.* annually, at the rate of 1*l.* per 1000*l.*, on property; 8*d.* per 1*l.* on profit. It is, at 7*d.* in the 1*l.* on gross income, 29*l.* 3*s.* 4*d.*

Although the incomes of the year are all equal in these 9 cases, and they are taxed at the same uniform rate under the income tax, the *values* of the properties range from 6,500*l.* to 33,333*l.*

It is quite evident that the "abilities" of J and L, for example—are not equal; for J is worth 26,833*l.* more than L, and could if he chose, by investing his capital in long annuities, expending the interest and reinvesting every year the returning capital, obtain a nominal income of more than 5,128*l.* a-year. And so in other cases.

The nine persons in possession of *equal incomes* cannot exchange the titles to those incomes—on equal terms—in the market. In this they differ entirely from persons in the possession of properties of equal value.

I have proved that a tax at a uniform rate per cent. per annum on all the property inherent and external in the United Kingdom, may be justly entitled equitable. And I have proved, I think, that the tax called a tax on profits is, as it is levied, a tax on income—a tax rated on the profit of one class—on the produce of another—and therefore unjust and inequitable.

The first proposition will probably be admitted by those who have hitherto held that an Income Tax is a just tax; and after the best consideration which I have been able to give to the subject, I freely make this concession, that an Income Tax, inequitable as it is, is less inequitable, and interferes less with the production and commerce of the country, than the taxes which have either been repealed by its imposition, or still remain a part of the fiscal system of the kingdom. The inequality in the pressure of the Income Tax is not compensated but aggravated in the other taxes.

Our revenue system has, it is true, now been rendered less objectionable than that of any of the other great countries of Europe: it presses less on the industry of the people, is collected better, is certainly less oppressive to the classes who live on wages. A reference to the tariffs and taxes of the respective countries, places this beyond doubt. Mr. Laing, in his *Observations on the state of the European people*,* and M. Emile de Girardin in his work on the taxation of France (*L'Impôt*), show that inequality, interference, expense, and complexity, characterize the fiscal system of the continent. All Adam Smith's maxims are there violated: prohibition, monopoly, conscription, the salt tax, are the types of that system.

Our taxes are levied on imports, on the manufacture or sale of various articles, on certain kinds of property, on locomotion,—without any direct reference to the respective means of the people by whom the taxes are ultimately paid. No one has yet been able to calculate in what proportion the 37,597,495*l.* of revenue, collected under the heads Customs and Excise, fall on different classes of the population—on families, or on individuals. In this branch of the public revenue—paid indirectly—the question of equitable taxation does not arise and can scarcely be discussed. The rates of taxation have

* pp. 298, 301—2.

been for many years so high, as to be prohibitive in some cases, and prejudicial to the revenue in others. The amount of the revenue has increased, as the rates of the tariff have been depressed. Under the complicated system of the Stamps and Taxes, property in different forms, in the hands of different owners, is taxed at all rates varying from *zero* to 10 per cent. on the value. The land tax is levied on the assessed values of property in the 17th century: on some landowners the charge is heavy, on others light as a feather. A large deduction is made from personal property, at the death of every generation of its owners: on monies arising from real estate, land and houses devised to be sold, the tax is levied; the owners of all other land escape. Persons who insure their furniture, houses, and ships, pay 1,307,212*l.* a year; persons who do not insure their furniture, houses, ships, escape the tax; large house and ship owners, and the owners of other property not requiring insurance, pay no corresponding tax. Farm stock, insured, pays no duty. The house tax is either an unjust property tax, or a bad income tax,—graduated in the wrong direction,—so as to bear twice or thrice as heavily on low as on high incomes. 327,362*l.* out of the total tax of 707,018*l.** is paid by the inhabitants of Middlesex and Surrey, who return 25 out of 654 members of the House of Commons: certain goods sold are taxed, others are not taxed, on every transfer, by receipt and exchange stamps: nearly all transfers of real property are taxed; and as different properties are transferred at *intervals* of time ranging from days to centuries, the conveyance stamps operate unequally. Under settlements, “definite and certain sums of money, Government Stock, Bank, East India, South Sea Stock” are charged; land escapes. Some stock is taxed on transfers. A tax is levied, directly or indirectly, on persons who keep or travel in certain carriages, or ride on certain horses; persons who ride on other horses, in other carriages, are not taxed. Persons who employ domestic servants of one class are taxed; others are not taxed.

Under the heads of Customs, Excise, Stamps, and Post Office: Great Britain paid 42,279,483*l.*, Ireland 4,268,830*l.*, in the year 1851. Great Britain paid $\frac{1}{4}$ ths of this taxation. Great Britain paid besides 9,230,334*l.* in income tax, and assessed taxes; Ireland nothing.† Thus, while the taxes, which are generally supposed to be paid in undue proportion by the poor, are levied in Ireland, incomes above, as well as below 150*l.*, houses, carriages, horses, horsedealers, persons keeping male servants, wearing hair-powder, having armorial bearings—sportsmen in Ireland, the owners of land, and all property generally—are exempt from a class of taxes, which judging by analogy, ought to yield in Ireland, at least 923,033*l.* annually; yet it is for the protection of this untaxed property, that a large division of the army and a constabulary police, which was paid 560,126*l.* out of the consolidated fund of the United Kingdom, in the year 1851, is stationed in Ireland.

The practice of taxation in England, and still more in other countries, is, it must be admitted, regulated by maxims very different from that of Adam Smith, or from that to which I have called your attention. “The truth is,” says Mr. McCulloch, in his work on taxation, “that the greater number of taxes, including, we believe, every

* Parl. Paper, 1852, No. 54.

† See Table, p. 12.

one that is least injurious (?), are imposed on a totally different principle from that laid down in the first of Smith's maxims."‡ The practice of finance in modern times has been governed by such principles as follow: (1) Encourage—by increasing the prices—certain home productions, either by bounties, or by excluding the competition of foreigners: (2) Regulate your foreign relations and commerce by duties on imports or exports: (3) Discourage the consumption of articles, which, like spirits, are noxious; or are not indispensable, as tobacco: (4) Levy the taxes on many articles, in small sums, indirectly, so that the contribution to the revenue, may be concealed in the price of commodities or services:§ (5) Whenever property is converted into money by transfer, and its value is thus known, seize a part of the money: (6) Intercept produce at its source or on its passage to the pocket, and thus save the tax payer unpleasant annoyance, the tax collector trouble: (7) Let the payment of taxes appear to be in a certain sense voluntary, or depend upon some contingency: and generally, wise as serpents, harmless as doves, (8) Collect the taxes at any source from which they can be most readily obtained.

The only taxes that are collected in the United Kingdom, directly from the taxpayers, are 2,646,156*l.* of the assessed taxes; a part of the 1,142,906*l.* of land tax; the 1,864,161*l.* under the income tax

Revenue Collected in the Year, January 5, 1851-2. Drawbacks, Repayments, &c., are deducted.

	Collected in		
	Great Britain.	Ireland.	The United Kingdom.
	£	£	£
(1) Customs	20,118,970	2,078,105	22,197,075
(2) Excise	13,882,598	1,517,822*	15,400,420
(3) Stamps	6,061,007	468,043	6,529,050
(4) Post Office	2,217,308	204,860	2,422,168
(1—4) Total	42,279,883	4,268,830	46,548,713
(5) Land and Assessed Taxes	3,789,984	Nil.	3,789,984
(6) Income and Property Tax	5,440,350	Nil.†	5,440,350
(1—6) Total	51,510,217	4,268,830	55,779,047

The revenue which is derived from pensions, crown lands, the small branches of the hereditary revenue, surplus fees, and other resources, are omitted. See Finance Accounts, i.—viii., 1852, No. 196, p. 10, *et passim*.

* In Great Britain excise duties are also collected on the following articles, which are not charged in Ireland: hackney-carriages, 88,032*l.*; post-horses, 145,432*l.*; stage-carriages, 217,052*l.*; railways, 287,332*l.*; soap, 1,043,027*l.*; amounting in the aggregate to 1,780,875*l.* The hop duties paid in England were 426,208*l.*

† Irish proprietors who reside in Great Britain pay on the actual sums annually remitted to them.

‡ Mr. M'Culloch's book contains a luminous and authentic digest of the existing system of Taxation.

§ Montesquieu has a chapter on taxes headed: "Comment on conserve l'illusion." Machiavelli alone could do the subject justice.

in Schedules B and D, and a part of Schedule A; making probably in the aggregate little more than 5,000,000*l.* 50,000,000*l.* of the public revenue is collected indirectly, under a vast complicated system. The coasts are encircled by the Customs, the inland regions are occupied by the Excise and Stamps. In licenses, which are of an intermediate character, charged on the seller, paid generally by the buyer of goods, 1,160,571*l.* were raised in the year 1851 by the Excise, 224,317*l.* by the Stamps.

Little can be alleged in favour of the success or wisdom of the attempts to regulate private expenditure by sumptuary laws. Is it quite certain, for instance, that the tax on masters who keep male servants, is not rather a tax on wages, than a tax on luxury? that the tax on carriages is not a tax on coachmakers, as much as a tax on subjects "rolling in riches?" can locomotion, travelling, and intercommunication of every kind, be loaded with taxation, while stillness and repose are untaxed, without impeding the circulation of labour, goods, and thought—without damping the life of the nation? Why should obstacles be thrown in the way of sales, transfers, insurances of property? Is not the value of land depressed, interest on mortgages increased, more by uncertainty of title, and difficulties of transfer, than by all its other burthens?

Under a system of indirect taxation, an intelligent, free nation necessarily pays and sacrifices more than it does under an equitable system of taxation, chiefly levied directly. The expense of the indirect collection is large; the capital which is advanced in taxes, by the various classes of traders, remains at risk, until they are reimbursed by the consumers; and the interest, necessarily at a high rate, enhances the prices of commodities to an incalculable extent. The prices of the taxed articles are also raised by the virtual monopoly, almost always created, when the tax is productive, as in the case of malt and spirits. Foreign commerce is fettered by restrictions on the exchange of commodities; production at home, is repressed, by interferences with the processes of manufacturers. It is impossible to estimate either the total cost or the incidence of indirect taxation.

The rent of land under the feudal system was levied indirectly; and paid on a multitude of contingencies, as taxes are levied now, from the various orders of tenants; and it was only gradually, and almost imperceptibly, that the system of rents and rent days found its way into use. No one doubts in England, the infinite superiority—or questions the advantages to tenants—of the system of direct payment in money, over any other system of rents, any more than the superiority of the system of rates in towns over the continental octroi system.

The tenants of a great estate would scarcely accept, and would certainly derive little benefit from the acceptance of—a proposition such as the following, if proclaimed by their landlord: "Rent shall no longer be paid on this estate; but I will raise my revenue indirectly, and almost imperceptibly: recurring rent days, distresses, stewards, collectors, shall no longer oppress you: I will surround the estate not with walls but with a band of officers, who shall only collect tolls on the carriages, waggons, barges, ships, that pass our barriers; shall take as duties, the value of a certain portion of the timber, tea, coffee, sugar, wine, spirits, tobacco, raisins, currants, oranges, lemons, butter, cheese,

eggs, gloves, silk, lace, books, and the thousand other articles, which you may require in exchange for the productions of the estate. To collect these duties, it is indispensably necessary to prevent smuggling, and to destroy smugglers; I must, therefore, stop and examine every load and every parcel that passes the barrier; every time that you return from a journey, my officers must explore your boxes and bags; search, perhaps, your pockets; subject, if necessary, the persons and dresses of your wives and daughters to the scrutiny of expert women. Some of you are engaged in manufacturing soap, paper, malt, and other articles; you must then permit another class of my officers to collect from these manufacturers certain taxes; to watch, measure, weigh the produce, and to prevent fraud, control the processes. Those who keep or kill certain animals, or follow certain trades, must pay for licences. Your contracts of sales must be made invalid, unless they are written on stamped papers, for which considerable sums must be paid; at the death of some of you, my officers must seize a part of your property. The result will be briefly this: my net revenue will amount to no more than it amounts to at the present time; I shall gain nothing by the change; you will, of course, pay more, as my expense in collecting the revenue will be augmented; and the traders and manufacturers will require a liberal per-centage on the taxes which they advance: your freedom, commerce, and ingenuity will suffer; but you will be at liberty to imagine that you have the service of my houses and lands for nothing; you will pay no Rent."

It is possible that at some not distant time—the people of this country, at the instance of enlightened statesmen, may prefer paying directly and avowedly a larger part of their taxes than they do now, as an annual rent for the service of the state—for the defence of the empire, the maintenance of the public faith, the administration of justice, the pay of the civil service, the advancement of useful national works, the support of the dignity of the crown.

In so doing they will only be reverting to the old consecrated ways; for in the early Saxon laws and institutions, amidst all their rudeness, certain simple principles of equity reign: in the hundred, the guild, the borough, the protection, the *wergeld*, and the privileges, were proportioned to the services required from, and the services rendered by each man. Each burgess paid *scot* and *lot*;* his *shot*—or share of the public reckoning, his *lot*—or share of the public services. When the land was divided into *hydes* (274,950 according to Brady's estimate), each *hyde* was taxed equally and equitably; for a *hyde* of land was as much as one plough could manage, as much as would support one family. When, after the Conquest, under the feudal system, the kingdom was divided into 60,215 knight's fees, each fee furnished a knight for a fixed time, and defined service;† afterwards commuted into a payment in money called *scutage*. Returns of the fees in their possession, called *Carta Baronum*,‡ were made by the barons. The *subsidy* was an aid (in *subsidium regis*)

* *Scot* is in the Anglo-Saxon *shot*, payment; *lot* tribute. *Gild*, *geld*, a payment of money, was also the name of the first Saxon society. A guild was a club for mutual support by mutual contributions.

† Brady, vol. i., pp. 210, 211, 270.

‡ Madox, *Hist. Excheq.*, 2nd edition, cap. xv.

levied "on the lands or goods, at the rate of 4s. in the pound for lands, and 2s. 8d. for goods;"* the rate being undoubtedly on the *rent* of lands, and on the gross profit of goods; for 48d. and 32d. are in the proportion of 3 to 2; and if land worth 12l. returned 1l. in rent, goods, it is inferred, worth 8l. returned also 1l.† The subsidy was then an equal rate on the *property*; of at least 4d. in the pound on the value. The *fifteenth*, so often granted, is mentioned in Magna Charta; the barons granted the king a *fifteenth* of their *movable goods*. It was originally assessed on the goods of individuals (per capita); but in the 8 Edw. III. commissioners it is said, rated every town at the 15th part of the value of the town at that time; and the quota of taxation was recorded in the Exchequer, and served as the basis of the future payments; the inhabitants being allowed to rate themselves proportionally, so as to obtain the sum charged on the township. The subsidy and the *fifteenth* were equitable in principle, and were equitably assessed in the first instance; and they only became unequal, like our present taxes, by the negligence of the Exchequer. In the 4 Gul. et Mariæ, cap. 1, (sess. 1692), Parliament granted to their Majesties an aid of 4s. in the pound [of rent and gross profit], payable by every person or body in England, Wales, Berwick on Tweed, having any estate (1) in ready money, (2) in debts owing to him, (3) in goods, wages, merchandize, or other chattels, or personal estate whatever, in the realm, belonging to or in trust for him: *except* (1) such sums as he *bond fide owes*, (2) desperate debts owing to him, (3) *stock upon land*, (4) such goods as are in use as *household stuff*. The assessment is on what is called, incorrectly, the *yearly value*; and while land is taxed at the rate of 1l. in the 5l. of rent, or in the 100l. of value; every 100l. of ready money, and debts, and every 100l. worth of goods, wares, merchandize, or other personal estate, is charged 24s., or at the rate of 4s. in the pound, on the assumed *profit* of 6 per cent. Every person having any public office of profit, except officers in the army and navy, was taxed at the rate of 4s. on his salary. This important tax was a *property tax* in the common sense of the word; and is the basis of the *land tax*, improperly so called.‡ The land was taxed at the rate of 20 per cent. on the *rent*; which was equivalent to 1l. per cent. on its *value as property*; for land was then worth 20 years' purchase: (under the present income tax, the annual charge on land is at the rate of nearly $\frac{1}{10}$ th per cent. on its value.) And stock in trade was charged at the rate of 20 per cent. on its gross *profit*;—1·20l.=1l. 4s. per cent. on its *value*; from which it is evident that the annual profit on 100l. of stock, was inferred to be 6l.; or the profit was reckoned to be worth $16\frac{2}{3}$ years' purchase. On the principle of the ancient subsidy, stock in trade should have been charged 2s. 8d. in the pound on *profit*; or in this case 16s. (=8l.) per cent. on its *value*. The tax as it was levied in the new form, included a rate on the produce of the stock-

* General Index to first seven vols. of Journals of House of Commons.

† Sir Joshua Child, in his Discourse on Trade, shows that in 1621 land was only worth twelve years' purchase in England; the rate of interest on investments was $8\frac{1}{2}$ per cent.

‡ See section 4. Manors, messuages, lands, tenements, quarries, mines of coal, tin, lead, copper, iron, salt springs, parks, chaces, warrens, woods, fisheries, tolls, annuities, all hereditaments of what nature or kind soever, shares in the New River and other companies, are charged at the rate of 4s. in the 1l.

owner's *industry*; and was a tax on this class of the inherent property of the country. A tradesman who had 1,000*l.* engaged in trade was taxed 4*s.* in the pound, on an assumed profit of 60*l.*; and as the average profit in the sense it has in trade, including his own earnings, could not then have been less than 120*l.* or 180*l.*; the tax pressed unevenly, but it did not press unduly on the industry of the country.

No person whose lands were worth less than 1*l.* of "yearly value," (20*l.* of value) was liable to be charged. Lands and houses unoccupied were taxed.

This act embodies the most remarkable financial measure in the statute book: it was levied at rates varying from 1*s.* to 4*s.* in the pound on *rents* until 1798, when it was made a perpetual charge on the land under the old assessments; and the administrative machinery is employed in the present day. It had in it from the first, however, a leaven of injustice, which was fatal to its efficiency; it was badly administered, and it was, as we have seen, at last converted by Mr. Pitt, into a reserved, redeemable rent on real property. This great act unwisely embodied a penal clause in a measure of finance: "Papists and every person who has not taken the oaths of supremacy and allegiance, shall pay double," was one of its enactments. The trading classes were taxed on their stock, although this varies in different trades; and as the property inherent in lawyers, doctors, and the professional classes, does not exist in the form of stock, they were not charged under a tax which should have been levied on the value of the services of men, as well as of land. It had the defects of the American system. It did not extend to Ireland or Scotland. The tax on stock in trade and personal property was resisted and evaded, until it became insignificant in amount; and was abandoned in 1833. How could trades be taxed when the professions escaped?

In the ancient system of taxation, the customs duties were paid for protection on the seas; the subsidy was a rate on the *value* of property; equality was evidently aimed at in the original enactments; and, notwithstanding their corruptions, was in many cases achieved, as far as was possible in a state of disorder and insecurity, under a rude administrative machinery, and in the absence of the science which may shed some of its light on finance as well as on other arts in these latter days.

The principle of proportionality and equity, as is evident from these facts, is not a stranger to the English system of taxation; and it still lives in the minds of the people, like one of those eternal ideas that are recollected, and are not discovered, even by such men as Adam Smith. All that remains to do, is to show how the principle can be carried out and applied under a complicated system of property: how the Customs can be levied on the "old foundation of guarding the seas, that merchants might trade hither with safety;"* how the Excise duties which, except those on deleterious stimulants, rest on no defensible basis, may be gradually commuted; how the department of Stamps, can, by being converted into a great system of records, for the registration of property, titles, contracts, and transfers, —without sacrifice to the revenue,—enhance the value of property by many millions, and render more important services than the Post

* Cunningham, *History of Taxes*, p. 25.

Office; how the income and other taxes can be adjusted; and the whole revenue be made to tend—to what it may ultimately become—simply an *equitable rent on all the property* of the people in the United Kingdom.

If the value of the inherent and external property of the United Kingdom is set down at 10,000 million *l.*, (and it can scarcely be less); the net annual profit at 300 million *l.*; the annual produce at 600 million *l.*; then a rent tax of *one farthing* in the pound on the value of the property, will return 10,416,667. of revenue; and if the property which can be reached directly by the revenue officers is reduced to 5,000 million *l.*, the rent will be reduced in the same proportion.

I have discussed the income and property tax as a pure question of statistical science: and have endeavoured to show—that in spite of the corruptions of modern practice—the principle of an equitable tax—by an equal rate—on the *property* of every subject of Her Majesty—is a fundamental principle of the old English law. I infer that this principle can never be safely disregarded in any country; and least of all in England, where the Minister of Finance was formerly, by a significant arrangement, a Minister of Justice; and as he is now, the pillar on which the Public Credit rests, also the designated Administrator, and great practical Teacher of Equity in the common business of life.

The feeling of the intelligent classes of the community on the subject of the income tax is not directed against the amount, or the principle, of an equitable property tax; it is excited by the inequality of the assessments. This feeling deserves to be respected. It is a remarkable fact, that people are more easily excited to action and resistance to inequitable taxation, than to impositions which violate the loftier sentiments of our nature. And this conduct is generally denounced by historians as baseness. Rötteck, a German of high rank among historians, recording the revolt of the Netherlands, says:—"Then Alva exacted the hundredth penny of the gross property (*gesammten vermögen*) of all the inhabitants of the United Provinces; then the twentieth and the tenth penny of every alienation (*veräußerung*) of immovable and movable goods; and what the executioner's axe had not excited, the tax-gatherer did—a rebellion. To the tenth penny—it is humiliating to say it—to the tenth penny Holland owes her freedom."*

The part which a system of taxation, unparalleled in its injustice, played in exciting the French revolution is well known; and the writings of Boisguillebert and Vauban, as well as the returns of taxes, prove that it was not the amount but the injustice of the levy, that ruined and exasperated the country. In sensitiveness on the subject of injustice generally—and of evident injustice in taxation particularly—the people of England are not behind any other people in the world. In the imperfect reports of the proceedings of the House of Commons, the earliest instance of a division being contemplated is found in 1523, under Henry VIII., and it referred to the grant of a subsidy:—"There has been the greatest and sorest hold on the lower house for the payment of the subsidy that was ever in any Parliament. It has been debated sixteen days together; the resistance was so great that the house was like to be dissevered" [divided]. This debate is "instruc-

* Allgemeine Geschichte, von Carl von Rötteck, 7 B. p. 291.

tive," says a late writer on constitutional history, "as indicating the national characteristic love of money so early developed. It is curious and humiliating to think that a Parliament, ever ready to ratify religious innovations, which must have seemed either impious schism or baneful superstition to every member of the Legislature, and who prostituted the powers of Parliament to attain the unhappy women or discarded tools which the tyrant wished to be rid of, should have bristled up with something of modern constitutional obstinacy at the vote of a subsidy."*

The important part which tonnage, poundage, shipmoney—taxation in fact—played in the English revolution, is also well known; and the dissatisfaction in this period, and in the century preceding, was, Mr. Raikes must allow me to say, not so much created by the English love of money, as by the English love of justice. The national income in the reign of Charles I. was 900,000*l.*; after the intestine struggle was over, the people paid in taxes double the amount of the taxes which they had paid previously (1,800,000*l.*); after the next revolution the people paid taxes under King William III. amounting on an average to 3,895,205*l.*† Hampden felt oppressed, not by the 20*s.* at which his estate was rated, but by the injustice of its exaction; and he shed his blood in resistance. Every man pays with satisfaction his fair share, legally imposed, of a public tax, or a private contribution; and resists an unfair demand with indignation. This instinctive sentiment has an important signification. Upon looking closely into the question of equity in taxation, it will be found to be the basis of that Security of Property, on which the fabric of society rests. If all property is taxed at a uniform rate, the exchangeable values of different kinds of property remain unaltered; and the owners remain in the enjoyment of its undisturbed possession, as they know that whether the rate of taxation is lowered or raised, to supply the exigencies of the country, it will affect all property in the same degree. The reverse happens when the taxation is not equitable.

The effects of an equal and of an arbitrary system of taxation may be thus illustrated:—Let a nation consist of 1,000 landowners, each in the possession of rents of 10,000*l.* a year, worth 300 million *l.* The rents will be 10 million *l.* Let a tax of 1 million *l.*—or of $\frac{1}{300}$ on the value of the property—be levied first equitably; then each landowner will expend 1,000*l.* a year on certain public objects in which he and the other landowners are interested. Now, let an arbitrary despot intervene, who raises the same amount of revenue, 1 million *l.*, by seizing every year the forfeited estates of 100 proprietors. You see at once what an engine of oppression this system of taxation becomes; the same amount of revenue is raised but the free soul of every subject is tortured, subjugated, or destroyed; if the value of the rent is, in the equitable state, thirty, it is, in the arbitrary state, not worth ten, not five years' purchase. If the tax is levied at different rates, by classes and parties on other classes and on other parties, the same insecurity is created. If the proprietors of land and property in the best class of securities pay 7*d.* in the pound on

* Raikes, *Constitutional History*, pp. 228—9.

† Sinclair's *History of the Public Revenue*. Reigns, Charles I., Charles II., William III.

their revenue, the industrial and professional classes pay at least 14*d.* in the pound under an income tax on their net profits, or their incomes after excluding the returning capital. Consequently some members of that important class of persons who derive their revenue from personal or real property will pay on a higher quota, and the class in whose life the property which returns income is invested, will pay on a lower quota in a system of equitable taxation, than they pay under an income tax. Still, security is of so much importance to the former class, that they are more interested than any other body of men in the establishment of a sound system; for if the right to levy the same amount of tax on properties which the science and the common sense of the country have discovered to differ in value, is deliberately sanctioned, no visible property will be safe. If one class in power is favoured one year, another class will struggle for the same, or for greater favour the next; and in the struggles and convulsions that always follow the reign of injustice, none are, judging from experience, so sure to suffer as those in the possession of realized property. A just distribution of the taxation of the country over all classes, and over all the property of the country—bearing, like the pressure of the atmosphere, equally on all sides—if firmly established, will present an irresistible barrier to anarchical inroads on the rents of land—or the interest of money; and while the industry of the country is left free, Property, on the firm ground of the public faith, will rest on an everlasting foundation.

II.

On the Equitable Taxation of Property and Profit in Annuities, Rents, Life Interests, and Industrial Incomes.

IN the present part I propose to investigate very briefly the most important questions in this branch of finance, on the principles, and by the methods, which have been already applied to the doctrines of interest, life annuities, and life insurance; of which the fundamental problems are here taken for granted. The reader is referred for the investigation of those problems to the works of Price, Bailey, Milne, and other writers on the doctrines of interest and life insurance. The principles which are the basis of this inquiry may be thus stated.—

Axiom.—A tax on the subjects of a state is equitable when it is proportional to the value of the property severally in their possession, and to the time of possession:

That is, (1) when each subject of the state is taxed equally on the same amount of property during the same time:

(2) When, in the same time, the tax is in proportion to the property; Thus, if the annual tax on £1000 of property is £1, the tax on £2000 is £2, the tax on £3000 is £3:

(3) When on the same amount of property the tax on the proprietor is in proportion to the time of possession: Thus, if on £1000 the tax is £1 in *one* year, it is £2 in *two* years, £3 in *three* years:

(4) Or generally when the tax varies in the compound proportion of the time and the value of the property. Thus, if the annual rate of tax in the £1 is represented by *a*, the time over which the tax extends by *n*, the property by *P*, the tax varies as either of these elements varies; or

tax $\propto a n P$. Thus, if $a = \frac{2}{1000} = .002$; $n = 3$; $P = 2000$; the tax $= .002 \times 3 \times 2000 = 12$. If $n = 2$; $P = 4000$; the tax $= .002 \times 2 \times 4000 = 16$.

By the doctrines of simple interest, the amount of interest is also proportional to the time and the principal. Thus, if the interest of £1 in one year is i , then the interest on £P in n years is $i n P$. Now the annual interest is to the principal, or property, as $i P : P$; consequently $i : 1 :: a : \frac{a}{i}$ = the annual rate of tax, per £1, on interest or profit, equivalent to a tax of £ a per £1 on capital.

Before proceeding to the investigation of the values of annuities, and to the determination of the tax chargeable on property in annuities and industrial incomes, it is necessary to explain the symbols to be employed. The results are sufficiently simple; but in the inquiry problems of considerable intricacy have to be solved, which it is impossible to accost except by mathematical analysis.

SYMBOLS.

i = the interest of £1 in one year, when interest is convertible annually: consequently £1 at interest one year amounts, with its increase, to $1 + i$ at the end of the year; and $i P$ is the interest of any capital P in a year (for $1 : i :: P : i P$.)

$v = \frac{1}{1+i}$ = the *present value* of 1*l.* payable at the end of a year.

$$v^{-1} = 1 + i \therefore v + vi = 1 \therefore i = \frac{1}{v} - 1$$

$V_n = v + v^2 + v^3 \dots + v^{n-1} + v^n = \frac{1-v^n}{i} = \frac{1}{i} - \frac{v^n}{i}$ = the present value of £1 a year for n years.

For v^n is the value of £1 to be received at the end of n years; and $\frac{1-v^n}{i}$ = the sum of the geometrical progression $v + v^2 \dots + v^n$.

If n is infinite ($=\infty$), then $V_\infty = \frac{1}{i}$ = the value of a perpetuity; and $\frac{1}{i} - \left(\frac{1}{i} - \frac{v^n}{i}\right) = \frac{v^n}{i}$ = the value of the reversion of an annuity of £1 to be entered on at the end of n years. The $(n+1)^{th}$ is the first payment to the reversioner.

NOTE —Tables of v^n and V_n have been calculated and published for all the values of n from 1 to 100, at the common rates of interest.

I = annuity, annual rent, or income. In the case of a perpetuity I is simply the yearly *interest* of the capital.

a = the tax per annum on £1 of property, or the *uniform rate of taxation*. \therefore if the tax is payable in equal instalments t times in the year, $\frac{a}{t}$ is the rate of tax on the property during the t^{th} part of a year.

$I V_n = I \cdot \frac{1-v^n}{i} = I (v + v^2 + v^3 \dots + v^n) =$ the present value of the annuity I for n years.

$P = IV_{\infty} = \frac{I}{i}$ = the value of a property returning the annuity or rent I in perpetuity; where P and I are so related that $\frac{P}{I} = V_{\infty}$.

Here $I = iP =$ the *annual interest* of $P = \frac{P}{V_{\infty}}$

$aP = aIV_{\infty} = \frac{a}{i}I$ = the *annual tax* on the property, \therefore a tax at the rate of $\frac{a}{i}$ in the £1 on the interest is equal to a tax at the rate of a in the £1 on the property.

NOTE.—It is here assumed that the tax is assessed at the beginning of the year, and is payable with the annuity at the end of the year.

Let the tax be perpetual at the uniform annual rate of a in the £1 on property; then immediately before the payment of the year's tax:

$aP \cdot \frac{1+i}{i} = aIV_{\infty} \cdot \frac{1+i}{i} = \frac{aI}{i} \cdot \frac{1+i}{i} = aI \cdot \frac{1+i}{i^2} = aI \left(\frac{1}{i^2} + \frac{1}{i} \right)$
 $= aIV_{\infty}(1 + V_{\infty})$ = the present value of the tax payable at the same rate in perpetuity.

Immediately after the payment of the year's tax:

$aIV_{\infty} \cdot V_{\infty} = \frac{aI}{i^2}$ = the present value of the tax payable in perpetuity.

C = the value of the composition on any tax; or the present value of the future tax, whether levied in perpetuity or for a term of years, on certain or contingent incomes.

SECTION I.—Perpetual Annuity Certain, or Property in Fee Simple.

Case 1.—The tax is perpetual, and at the rate a in the £1 on property, or $\frac{a}{i}$ in the £1 on rent.

The present value of an annuity of £ b in perpetuity is $bV_{\infty} = \frac{b}{i}$;

and the tax $aP = aIV_{\infty} = aI \frac{1}{i}$, is of the nature of an annuity: consequently, by substituting these values for b in the above equation,

Eq. (1.) $C = aPV_{\infty} = \frac{aI}{i}V_{\infty} = \frac{aI}{i^2}$ = the value at the beginning of a year of the perpetual tax payable at the end of every year.

Immediately before the first payment, or if one payment of the tax is now due, its value must be added to the previous sum; then

Eq. (2.) $C = aP(1 + V_{\infty}) = aI \cdot \frac{1+i}{i^2} = aI \left(\frac{1}{i^2} + \frac{1}{i} \right) = a \frac{I}{i} (1 + V_{\infty})$.

Example.—What is the value of a tax of £1 in the £1000 on property returning £1000 a-year; or of £3. 6s. 8d. per cent. on the rent. if the interest of money is 3 per cent. per annum?

Here $i = .03$; $a = £.001$; $I = 1000$.

$C = .001 \times £1000 \times \frac{1}{.0009} = £1111.111 =$ the value of the tax in perpetuity $= 1\frac{1}{9}$ year's purchase of the annual rent.

$C = \frac{1.03}{.0009} = 1144.444 = 1111.111 + 33.333 =$ the value of the tax immediately before a payment is due. The property is £33333; and the annual tax assessed at the beginning of each year is £33.333.

Case 2.—The annuity is perpetual; the tax on it is for n years.

Eq. (3.) $C = a P V_n = a I V_\infty \cdot V_n = \frac{a I V_n}{i} = a \frac{I}{i} \cdot \frac{1 - v^n}{i} = a I \left(\frac{1}{i^2} - \frac{v^n}{i^2} \right) =$ the value at the beginning of the year of the tax on the property assessed at the beginning, payable at the end of each year for n years.

The uniform annual tax $\left(a I \frac{1}{i} \right)$ is strictly a perpetual annuity. Now the value of an annuity of £1 for n years is $\frac{1 - v^n}{i}$.

And $1 : \frac{1 - v^n}{i} :: a I \cdot \frac{1}{i} : a I \cdot \frac{1 - v^n}{i^2} = a I \frac{V_n}{i^2} =$ the present value of the tax on the property, payable for n years.

NOTE.—If the tax is immediately due, and payable n times: the interval between the first and the last payment is $(n - 1)$ years.

Eq. (4.) $C = a P (1 + V_{n-1}) = a I \frac{1}{i} \cdot \frac{1 - v^n}{1 - v} = \frac{a I (1 + V_{n-1})}{i}$
 $= a I \cdot \frac{(1 + i) - v^{n-1}}{i^2} =$ the present value of the tax assessed at the beginning of the year, payable at the end, immediately before the first payment is due.

Example—What is the present value of an annual tax, at the rate of £1 in the £1000, for 10 years, on the value of a perpetual annuity of £1000? If the annual rate of interest is 3 per cent. $1 + i = 1.03$, $v^9 = .766417$.

$C = .001 \times 1000 \times \frac{1.03 - .766417}{.0009} = \frac{.263583}{.0009} = \frac{8.7861}{.03} = 292.870$.

Case 3.—The tax and the annuity are perpetual; what is the value of the tax on the annuity chargeable after n years have elapsed?

NOTE.—It will be assumed, henceforward, that the tax is assessed at the beginning of every year, payable at the end of every year, and that the value C of the tax is taken immediately before the first payment of the tax is due.

It has been shown (Case 2,) that the value of the tax for n years on a property $\frac{I}{i}$ is $\frac{aI}{i} (1 + V_{n-1})$, and that the value of the tax in

perpetuity is $\frac{aI}{i} (1 + V_{\infty})$ (Case 1); consequently the value of the tax chargeable after n years is,

$$\text{Eq. (5.) } C = \frac{aI}{i} (V_{\infty} - V_{n-1}) = \frac{aI}{i} \cdot \left(\frac{1}{i} - \frac{1-v^{n-1}}{i} \right) = \frac{aI}{i^2} \cdot v^{n-1}$$

Example.—The tax is at the annual rate of £1 in the £1000; $I = £1000$; $i = .03$; $a = .001$.

Then the value of the tax chargeable after the first 10 payments is,

$$C = \frac{a v^9 I}{.0009} = \frac{.766417}{.0009} = 851.574$$

$851.574 + 292.870 = 1144.444$, the value of the tax on the perpetuity.

The value of the tax for n years *plus* the value of the tax ever afterwards, is necessarily equal to the value of the perpetual tax on the perpetuity.

If the annuity pass into the hands of A, B, C, in succession, the value of the tax chargeable on each can always be found.

The tax chargeable on each of the parties will vary every year, as is shown in the following equations, where the quantities between the vertical bars express the value of the annuity which belongs respectively to A, B, and C; A having at first the right to the three first, B to the three next payments, and C to the remainder.

$$\text{1st year. Eq. (6.) } C = \frac{aI}{i} \begin{matrix} \text{A} & \text{B} & \text{C} \\ (v^1 + v^2 + v^3) & | & (v^4 + v^5 + v^6) & | & (v^7 + v^8 + v^9 \dots v^{\infty}) \end{matrix}$$

$$\text{2nd year. } C = \frac{a}{i} \begin{matrix} \text{A} & \text{B} & \text{C} \\ I(v^1 + v^2) & | & (v^3 + v^4 + v^5) & | & (v^6 + v^7 + v^8 + v^9 \dots v^{\infty}) \end{matrix}$$

In the second year, A, having received one, is only entitled to two more rents; A's share of the property consequently decreases every year, while the share of the reversioner B increases every year until he receives his first rent, when his share, in like manner, decreases; C's share increases until he comes into possession of the perpetuity.

SECTION II.—Tax on terminable annuities certain—rents for terms of years certain—and reversions.

Of this class two cases may be considered; *first*, that in which the tax is assumed to be perpetual, or to be payable for as many terms as the annuity; *secondly*, that in which the tax is for a shorter term than the annuity.

Case 1.—A has a terminable annuity (I) which is payable at the end of every year, for n years; a tax of a per £1 per annum is assessed on the value of that annuity at the beginning of each year; the tax is payable at the same time as the annuity. Immediately before the first payment of the tax, what ought A to pay in composition for the whole of his future tax; or, in other words, what is the present value of the tax chargeable on the successive values of the annuity during the n years it has to run?

The value of the annuity on which the tax is assessed is at the beginning of the *first* year $= I (v^1 + v^2 + v^3 \dots + v^{n-1} + v^n)$. The

assessment of the first year's tax is $a I (v^1 + v^2 + v^3 \dots + v^{n-1} + v^n)$; which is also its *value at the end of the first year when it is due*.

The assessment of the second year's tax is $a I (v^1 + v^2 + v^3 \dots + v^{n-1})$. It is payable at the end of two years from the date of the first assessment; but only of one year from the date of the valuation. Hence the value of the second year's tax is $v a I (v^1 + v^2 + v^3 \dots + v^{n-1})$.

In the same way the value is found, of the third year's tax, to be $v^2 a I (v^1 + v^2 + v^3 \dots + v^{n-2})$.

By continuing the process, multiplying out and collecting the terms, we find as the result:—

$$\text{Eq. (7.) } C = a I \{1 v^1 + 2 v^2 + 3 v^3 \dots + (n-1) v^{n-1} + n v^n\}.$$

Thus, let $n = 5$; then the successive values of the tax payable at the end of each of five years, will be:—

No. of Payment.	Value of each Payment.	Value of all the Payments.
1	$1 a I (v^1 + v^2 + v^3 + v^4 + v^5) = a I$	$v^1 + v^2 + v^3 + v^4 + v^5$
2	$v a I (v^1 + v^2 + v^3 + v^4)$	$v^2 + v^3 + v^4 + v^5$
3	$v^2 a I (v^1 + v^2 + v^3)$	$v^3 + v^4 + v^5$
4	$v^3 a I (v^1 + v^2)$	$v^4 + v^5$
5	$v^4 a I v^1$	$+ v^5$

Or the value of the five future payments at the end of the first year is

$$C = a I (1 v^1 + 2 v^2 + 3 v^3 + 4 v^4 + 5 v^5).$$

By the formation of a series of the values

Eq. (8.) $G_n = (1 v^1 + 2 v^2 + 3 v^3 \dots + n v^n)$, in which n is made to vary from 1 to 100, all these valuations are facilitated. (See table III.)

If the annuity on which the tax is assessed is payable at the beginning of every year, and the tax is made then due, the value of the n payments is

$$\text{Eq. (9.) } C_1 = a I (1 + 2 v^1 + 3 v^2 \dots + n v^{n-1}).$$

TABLE III.

n.	Series, $v^1 + 2 v^2 \dots + n v^n$. Here $v = \frac{1}{1.03}$.	Sum of the Series $n v^n$, as far as 10 terms: and the sum of the Infinite Series.
	$n v^n$.	G_n .
1	.9709	.9709
2	1.8852	2.8561
3	2.7454	5.6015
4	3.5539	9.1554
5	4.3130	13.4684
6	5.0249	18.4933
7	5.6916	24.1849
8	6.3153	30.5002
9	6.8978	37.3980
10	7.4409	44.8389
∞	∞v^∞	1144.4444

Case 1*.—*Tax on the reversion of an annuity certain for a limited term.*

If the annuity and the tax are perpetual, but A enjoys the annuity for n years only, when the annuity passes into the hands of B, it has been shown, under section II, case 1, that A's share in the value of the annuity decreases every year, and that the present value of A's share of the tax is $C = a I (v + 2v^2 + 3v^3 \dots nv^n) = a I G_n$.

Then it may be demonstrated by the same reasoning that the present value of B's share of the tax is,

$$\text{Eq. (10.) } C = a I \{(n+1)v^{n+1} + (n+2)v^{n+2} \dots + \infty v^n\}.$$

It has been shown (Section I, Case 1) that the value of the perpetual tax on a perpetual annuity, is $\frac{aI}{i} (1 + V_\infty) = a I \cdot \frac{1+i}{i^2}$.

Consequently by subtracting the value of A's share of the tax from this quantity, the value of B's share of the tax, or the sum of the series Eq. (10) is immediately found; or

Eq. (11.) $C = a I \left(\frac{1+i}{i^2} - G_n \right) = a I \left\{ \frac{(1+V_\infty)}{i} - G_n \right\}$ = the present value of the reversioner B's share of the tax.

Example.—What is the value of the reversioner B's share of an annual tax, at the rate of £1 in the £1000, on the value of a perpetual annuity of £1000, the rate of interest being 3 per cent.; A having a right to the 10 next annual payments of the annuity?

The present value of

A's share of the tax is $C = .001 \times 1000 \times G_{10} = 44.839$.

The present value of

B's share of the tax is $C = .001 \times 1000 (1144.444 - 44.839) = 1099.605$.

Then also the present value of the tax justly chargeable on B, during the n years that the annuity is received by A, is

$$\text{Eq. (12.) } C = a I \cdot \left(\frac{1+V_{n-1}}{i} - G_n \right) = \frac{8.97087}{.03} - 44.839 = 254.190.$$

For the value of the tax chargeable on the perpetual annuity for n years is, by Section I, Case 2, $a I \frac{(1+V_{n-1})}{i}$; and as the value of A's share is $a I G_n$, the difference is chargeable on B.

Case 2.—*The tax is for a shorter term than that which the terminable annuity has to run.*

It has been assumed, under Section II, Case 1, that the tax is to be levied for as many years as the annuity is payable; now let the tax be levied annually for five years only, while the annuity has 7 years to run. In this case the annuitant wishes to compound for his tax; what is its present value?

The value of the annuity on which the tax is levied is at first $I(v + v^2 + v^3 + v^4 + v^5 + v^6 + v^7)$; it diminishes every year; and the present value of the tax,

Payable at the
end of the

1st year is $1 a I (v^1 + v^2 + v^3 + v^4 + v^5 + v^6 + v^7) = a I$	$v^1 + v^2 + v^3 + v^4 + v^5 + v^6 + v^7$
2nd year is $v a I (v^1 + v^2 + v^3 + v^4 + v^5 + v^6)$	$+ v^2 + v^3 + v^4 + v^5 + v^6 + v^7$
3rd year is $v^2 a I (v^1 + v^2 + v^3 + v^4 + v^5)$	$+ v^3 + v^4 + v^5 + v^6 + v^7$
4th year is $v^3 a I (v^1 + v^2 + v^3 + v^4)$	$+ v^4 + v^5 + v^6 + v^7$
5th year is $v^4 a I (v^1 + v^2 + v^3)$	$+ v^5 + v^6 + v^7$
6th year is $v^5 \times 0 \times I (v^1 + v^2)$	
7th year is $v^6 \times 0 \times I \times v^1$	

By collecting the terms it is found that

$$C = a I (1 v^1 + 2 v^2 + 3 v^3 + 4 v^4 + 5 (v^5 + v^6 + v^7)).$$

Instead of 7, let n be the number of years during which the annuity has to run, and $z < n$ the number of years over which the tax extends, then

$$\text{Eq. (13.) } C = a I (1 v^1 + 2 v^2 \dots + (z-1) v^{z-1} + z (v^z + v^{z+1} \dots + v^n) \\ = a I (1 v^1 + 2 v^2 \dots + (z-1) v^{z-1} + z (V_n - V_{z-1}))$$

When $z = n$

$$C = a I (v^1 + 2 v^2 \dots (n-1) v^{n-1} + n v^n) \text{ as above.}$$

Example.—The tax is at the same rate, and the annuity is £1000 for seven years; the tax is to be levied for five years; what is the present value of the tax?

$$C = G_4 + 5 (V_7 - V_4) = 9.155 + 5 \times 2.513 = 21.720.$$

SECTION III.—*Modifications of the formulas, where the tax on rents and annuities is paid half-yearly, quarterly, or in any period shorter than a year.*

If the annuity is paid half-yearly, the half-yearly dividend is $\frac{I}{2}$;

and if interest is convertible half yearly, $v = \frac{1}{1 + \frac{i}{2}} = \frac{2}{2 + i}$.

If the annuity is payable quarterly, the quarterly dividend is $\frac{I}{4}$

and if interest is convertible quarterly $v = \frac{1}{1 + \frac{i}{4}} = \frac{4}{4 + i}$,

If the annuity is payable, and interest is convertible t times in the year, the dividend is $\frac{I}{t}$; and $v = \frac{1}{1 + \frac{i}{t}} = \frac{t}{t + i}$.

If the tax is assessed on property at the rate of a in the £1 per annum, it will be $\frac{a}{2}$, $\frac{a}{4}$, $\frac{a}{t}$ in the £1 half-yearly, quarterly, t^{th} ; the tax on the property P to be levied at each collection will be $\frac{a}{t} \cdot P$.

The value of an annuity in which $v = \frac{1}{1 + \frac{i}{t}}$; and n the number of times, $\frac{n}{t}$ the number of years that the annuity is to be paid, is

$$\frac{I}{t} (v^1 + v^2 + v^3 \dots + v^n).$$

The tax on such an annuity is $\frac{a}{t} \cdot \frac{I}{t} (v^1 + v^2 + v^3 \dots + v^n)$.

By making $v = \frac{t}{t+i}$, and substituting $\frac{aI}{t^2}$ for aI in the previous formulas, the various values of C are obtained, when the tax is assessed and collected t times in the year.

SECTION III.*—*On the Conversion of the Present Value of a variable Tax into a uniform Annual Tax.*

The present value (C) of a tax, in all cases, is converted into a uniform annual tax by the formula :

Eq. (14.) $c_n = \frac{C}{1+V_{n-1}} = C \cdot \frac{1-v}{1-v^n} =$ uniform annual tax payable n times—of the same present value as C .

For the value of £1 a year, payable at the beginning of each year, for n years is $1 + V_{n-1} = 1 + v + v^2 + \dots + v^{n-1}$; and $1 + V_{n-1} : 1$

$$\therefore C : \frac{C}{1+V_{n-1}} = c_n.$$

The conversion of C into an uniform tax payable t times a year, is effected by making $v = \frac{1}{1+\frac{1}{t}}$; and n , the number of times that the tax is to be paid in the same Equation (14).

Eq. (15.) $c_n = aI \frac{G_n}{1+V_{n-1}} = aI \cdot \frac{v + 2v^2 + 3v^3 + \dots + nv^n}{1+v+v^2+\dots+v^{n-1}}$
 $=$ the uniform annual tax on a terminable annuity certain having n years to run.

$$\text{Eq. (16.) } c_n = aI \left(\frac{1+V_{n-1}}{i(1+V_{n-1})} - \frac{G_n}{1+V_{n-1}} \right) \\ = aI \left(\frac{1}{i} - \frac{G_n}{1+V_{n-1}} \right) = \text{the uniform annual tax chargeable}$$

during n years on the reversioner.—See Sect. I, Eq. 4.

And so in all other cases, the value of the variable tax on the varying values of terminable annuities, and the equivalent uniform tax, can be determined.

The interest of a principal sum, or a property convertible into money, is of the same amount as the perpetual annuity into which the property can be converted; thus $iP = iIV_n$ is the interest, and also the perpetual annuity, into which the value of a property can be converted,—as iIV_n is the perpetual annuity into which the terminable annuity can be converted. Now, a tax for one year of a in the £1 on the property (IV_n), is aIV_n ; and a tax for one year of $\frac{a}{i}$ in the £1 on the

annuity iIV_n is also $\frac{a}{i} \cdot iIV_n = aIV_n$. \therefore the same amount of tax is levied in all cases of annuities, either under a tax of a in the £1 on property, or on the values of annuities; and a tax at the rate of $\frac{a}{i}$ in the £1 on the interest, or the perpetual annuity into which it can be converted. If the property is actually converted into a perpetual annuity, and iIV_n is paid out of it annually, instead of I , the annual tax remains invariably aIV_n ; if, on the other hand, the conversion is not effected, but I is paid annually, inasmuch as V_n diminishes every year

as n decreases, the perpetual annuity into which it can be converted, and consequently the tax of $\frac{a}{i}$ in the £1 on that variable perpetual annuity, or on the interest of the residual capital, decreases. One of the common fallacies current on the subject has arisen from inattention to this fact, that the perpetual annuity into which a terminable annuity can be converted becomes less and less every year.

$\frac{V_n}{V_\infty} \cdot I_n = I = (1 - v^n) I_n$ = the perpetual annuity into which an annuity I_n for n years can be converted. For

$$V_\infty : V_n :: I_n : \frac{V_n}{V_\infty} \cdot I_n = \frac{1 - v^n}{i} \cdot \frac{i}{1} I_n = (1 - v^n) I_n$$

Conversely $\frac{V_\infty}{V_n} \cdot I = \frac{I}{1 - v^n} = I_n$ the short annuity into which the perpetual annuity I can be converted.

If a perpetual annuity I belongs to two persons, the one A entitled to n annuities, and the other B entitled to the remainder, then it may be at once divided into two perpetual annuities, severally and simultaneously payable to A and to B .

The share of the perpetual annuity falling to B will be $= v^n I$.

The share of the perpetual annuity falling to A will be $(1 - v^n) I$.

The value of a perpetuity is to the value of the reversion, after n years, as 1 to v^n .

$$v + v^2 \dots + v^n + v^{n+1} \dots + v^\infty : v^{n+1} \dots + v^\infty :: 1 : v^n;$$

$$\text{Or, } V_\infty : V_\infty - V_n :: 1 : 1 - \frac{V_n}{V_\infty} = v^n.$$

And the value of a perpetuity is to the value of an annuity for n years, as 1 to $1 - v^n$;

$$\text{Or, } V_\infty : V_n :: 1 : 1 - v^n;$$

$$\text{Or, } v^1 + v^2 + v^3 \dots + v^n + v^{n+1} \dots + v^\infty : v^1 + v^2 \dots + v^n :: 1 : 1 - v^n.$$

If the tax on the perpetuity is known, the respective shares of the tax payable by A and by B each year is deduced by making n vary in the following equations, where $\frac{a}{i}$ is the rate of tax in the £1 on the

interest, and $\frac{a}{i} I$ is the annual tax on the perpetuity.

	B's share of the constant tax is, $n, n-1$, &c., years before he receives his first rent.		A's share of the tax is.
n years	$v^n \frac{a}{i} \cdot I$	+	$(1 - v^n) \frac{a}{i} \cdot I = \frac{a}{i} I.$
$n - 1$	$v^{n-1} \frac{a}{i} I$	+	$(1 - v^{n-1}) \frac{a}{i} \cdot I = \frac{a}{i} I.$
	*	*	*
2 years	$v^2 \cdot \frac{a}{i} \cdot I$	+	$(1 - v^2) \frac{a}{i} \cdot I = \frac{a}{i} I.$
1 year	$v^1 \cdot \frac{a}{i} I$	+	$(1 - v) \frac{a}{i} \cdot I = \frac{a}{i} I.$

The sum of the taxes chargeable each year on A and B is equal to $\frac{a}{i} \cdot I$, the tax on the perpetuity.

The tax on the perpetuity is $\frac{a}{i} \cdot I$, and B, the reversioner's share of the first of n annual taxes payable before he receives his first rent is $v^n \frac{aI}{i}$; which in n years at interest will amount to $\frac{a}{i} I$. The share of the tax, therefore, chargeable on him and left to accumulate at interest, amounts to the same sum as the whole of the annual tax on the perpetuity.

SECTION IV.—*Taxes on Reversions,—and on the Temporary Possessors of Annuities.*

It has already been seen that if a property P is held by two parties, the one A in possession of the rents for n years, the other B entitled to the reversion, the number and, therefore, the present value of A's rents every year, decrease, and the value of the reversion increases as the period of B's enjoyment of the rents approaches. (Sect. I.) If a tax of a in the £1 be levied on the property annually, then the portion of the tax chargeable on A will decrease in the same ratio as the value of his share of the property, while B's share of the tax will every year increase.

And if A pay, as at present, the whole of the tax chargeable on the perpetuity during his term of possession for n years, B is bound in equity, when he receives the first rent, to repay the whole of the tax to A. For the *interest* of the money which A has advanced for B as tax, amounts, in n years, to the same sum as the whole of the tax chargeable in the n years on A.

The variable proportion of the uniform annual tax chargeable respectively on A and on B is found by making n vary in the equation

$$C = aI \overset{A}{(v^1 + v^2 \dots + v^n)} + \overset{B}{v^{n+1} + v^{n+2} \dots + v^\infty}.$$

Now immediately before A pays the first annual tax, or n years before B will receive his first rent, B's share of the tax is $aI(v^{n+1} + v^{n+2} \dots + v^\infty)$; which at interest for n years becomes $aI v^{-n}(v^{n+1} + v^{n+2} + v^{n+3} \dots + v^\infty) = aI(v + v^2 + v^3 \dots + v^\infty)$.

While this is the amount at interest of B's share of the tax which A has paid, it is precisely the whole tax annually chargeable on the property. And as the whole of the tax chargeable on the perpetuity is paid annually by A, n times, A's claim on B at the end of $n + 1$ years from the date of assessment, or n years from the date of the first payment, is $n aI(v^1 + v^2 + v^3 \dots + v^\infty)$; which is equal to the whole amount of the tax paid during n years.

As $aI(v^{n+1} + v^{n+2} + \dots + v^\infty)$ amounts to $aI(v^1 + v^2 + \dots + v^n + v^{n+1} \dots + v^\infty)$ in n years, the interest is equal to the difference between these two values; and the difference is $= aI(v^1 + v^2 \dots + v^n) = aI V_n = A$'s share of the first annual payment of the tax. Here n may have any value. Consequently the *interest* of the share of the tax advanced for B by A in any year is, in the interval of time between that payment and the first payment of

B, equal to the share of the tax equitably chargeable on A during that year. A pays his tax when it falls due; B returns his own share of the tax and the interest, which happens to be equal in amount to A's share of the tax. B does not return or in any way pay A's tax.

Consequently if the tax-collector takes annually from A, who has an annuity payable at the end of each year for n years, the same tax as is justly chargeable on a perpetual annuity, namely, $aI(v^1 + v^2 \dots + v^\infty)$, then the State at the end of n years should return the whole amount of the tax collected from A, namely, $naIV_\infty$, if it desire to place him on an equality with the possessors of property and annuities in perpetuity. The interest of the property of which he has been deprived, and of which the State has had the use during n years, is equivalent to his share of the tax.

Example.—A is in possession of an annuity of £300 a year, payable at the end of every year for 5 years; and B has the reversion. The property is taxed at the annual rate of £1 per £1000, payable at the same time as the annuity; so $a = \cdot 001$; and $I = 300$. Let the interest of money be 3 per cent. per annum ($i = \cdot 03$); then the value of the perpetuity is $300 \times 33\cdot 333 = \frac{300}{\cdot 03} = £10000$; and the tax is $10,000 \times \cdot 001 = £10\cdot 000$ annually. The tax on the perpetuity $\left(\frac{aI}{i}\right) = \frac{\cdot 001}{\cdot 03} \cdot 300 = 10$ multiplied successively by v^5, v^4, v^3, v^2 , and v^1 , is B's share of the tax 5, 4, 3, 2 and 1 years before he receives the first annuity; while 10 *minus* these respective quantities is the share of the tax chargeable every year on A.

Interval between the first payment of the Tax and B's first receipt of Rent.	n	B's share of the Tax.			A's share of the Tax.		
		£	s.	d.	£	s.	d.
First payment	5 years	8·626	=	8 12 6	1·374	=	1 7 6
Second	4	8·885	=	8 17 8	1·115	=	1 2 4
Third	3	9·151	=	9 3 0	·849	=	0 17 0
Fourth	2	9·426	=	9 8 6	·574	=	0 11 6
Fifth	1	9·709	=	9 14 2	·291	=	0 5 10
Sixth	0	10·000	=	10 0 0			

Here it will be found that B's share of the first payment is £8·626; which at interest amounts in *one* year to $8\cdot 626 \times 1\cdot 03 = 8\cdot 885$; in 2 years to £9·151; in 3 years to £9·426; in 4 years to £9·709; in 5 years to £10. B's share of the *second* payment is £8·885, which in 4 years amounts also to £10; B's share of the *third* payment is £9·151, which in 3 years amounts to £10; B's share of the fourth payment is £9·426, which in 2 years amounts to £10; B's share of the fifth payment is £9·709, which in *one* year amounts to £10. The interest of B's share of the tax is in each case equal, by the time that he receives his first rent, to A's share of the tax at the time that A's tax is paid. If A pays the whole of the tax, he has therefore a claim on B at the *end* of the term for $5 \times 10 = £50$; namely for £45·797 of tax chargeable on B, and for £4·203, the interest on the same.

of £1000 for 7 years is obtained by investing £6230, which returns £7000 in the dividends; namely, £770 of interest, and £6230 of capital. The tax is £210; namely, £23·1 on interest, and £186·9 on capital.

If the interest of money is 5 per cent., an annuity of £1000 for 7 years is obtained by investing £5786; returning in 7 years £7000; of which £1214 is interest, £5786 capital.

Under annuities terminable in 5, 10, 15, 20 n years, the capital is returned every 5, 10, 15, 20 n years. Under a tax, therefore, assessed at the rate of $\frac{a}{i}$ in the £1 on the dividends of such

annuities, the interest is taxed at that rate; and of the capital $\frac{a}{i}$ is taken in the course of every 5, 10, 15, 20, n years. In perpetual annuities n is infinite, and no part of the capital is touched.

$$\frac{a}{i} \cdot \frac{I}{n} (n - V_n) = \frac{a}{i} \cdot \frac{I}{n} \left(n - \frac{1 - v^n}{i} \right) = \text{the average annual tax}$$

on the amount of interest, at the rate of $\frac{a}{i}$ in the £1.

$$\frac{a}{i} \cdot \frac{I}{n} V_n = \text{the average annual tax on capital.}$$

$$\frac{a}{i} \cdot \frac{n I}{n} = \frac{a}{i} \cdot I = \text{the annual tax on the annuity.}$$

As $n I$ = the amount of annuity which is drawn in dividends;

and $\frac{a}{i} \cdot n I$ = the aggregate tax on the same.

Then the tax, at the rate of $\frac{a}{i}$ on the interest ($i P$), is to the tax on the annuity as $\frac{a}{i} (n - V_n) I : \frac{a}{i} n I :: (n - V_n) : n$.

And $n - V_n : n :: \frac{n}{n - V_n} : x$ = the ratio of the tax on the interest only, to the tax on the annuity. This function, keeping n an integral number, gives a maximum when $n = 1$; when $x = \frac{1}{1 - v} = \frac{1 + i}{i}$; and it falls to unity, its *minimum*, when n is infinite. ∴ if

the tax is at the rate of $\frac{a}{i}$ in the £1 on the dividends of a perpetual and of a terminable annuity, it is at the rate of $\frac{a}{i}$ in the £1 on the interest in the former, and of $\frac{n}{n - V_n} \cdot \frac{a}{i}$ in the £1 on the interest, in the latter case. If $\frac{a}{i} = \cdot 03$; and $i = \cdot 05$; $n = 7$,

$$\text{then } \frac{n}{n - V_n} \times \cdot 03 = \frac{7 \times \cdot 03}{7 - 5 \cdot 786373} = \frac{\cdot 21}{1 \cdot 213627} = \cdot 17343.$$

While the tax is $\cdot 03$, or at the rate of 3 per cent. on the interest of the

property in perpetuity, it is 17·343 per cent. on the interest of the annuity for 7 years.

$$e = \frac{1 + v^1 + v^2 \dots + v^{n-1}}{i(v + 2v^2 \dots + nv^n)} = \text{ratio of the present value of the tax}$$
$$\frac{a}{i} \text{ on interest, to the value of the tax } \frac{a}{i} \text{ on annuity for } n \text{ years. It}$$

approximates to *unity* as *n* increases.

Case 2.—The perpetual annuity which the capital *P* will purchase is $\frac{P}{V_\infty} = iP$; and the annual tax, at the rate of $\frac{a}{i}$ in the £1 on the dividends is $\frac{a}{i} \cdot \frac{P}{V_\infty} = aP$.

The annuity for *n* years, which *P* will purchase, is $\frac{P}{V_n} = \frac{iP}{1-v^n}$ for $\frac{1}{V_n} = \frac{i}{1-v^n}$; and the annual tax, at the rate of $\frac{a}{i}$ in the pound on such annuity, is $\frac{a}{i} \cdot \frac{P}{V_n} = \frac{aP}{1-v^n}$.

And $\frac{a}{i} \cdot \frac{P}{V_\infty} \cdot V_\infty = \frac{a}{i} \cdot \frac{P}{V_n} \cdot V_n = \frac{a}{i} \cdot P$. That is, the present value of a tax at any rate $\left(\frac{a}{i}\right)$ in the £1 on an annuity for *n* years, is equal to the present value of a tax at the same rate of $\frac{a}{i}$ in the £1 on a perpetuity, when the property from which the annuities are derived and the rates of interest are equal.

This fact is the groundwork of a singular fallacy which has puzzled some acute thinkers, mathematicians, and logicians; and may be thus stated. It is assumed, and admitted in the argument, that the income tax is perpetual.* A has £3,333; he invests it in an annuity certain for 12 years; which, allowing the interest of money to be 3 per cent. per annum, will return an annuity of £333, nearly, payable at the end of each of the 12 years.

B has also £3,333, which he invests in the 3 per cents. (consols), at par, from which he derives £100 a year.

A's income tax at the rate of 3 per cent. on the terminable annuity, is £10 a year for 12 years; and as the tax, as well as the annuity, is worth 10 years' purchase, the present value of A's tax is £100.

B's income tax, at the rate of 3 per cent. on his annuity of £100, is £3 a year; the tax, as well as the annuity, is worth $33\frac{1}{3}$ years' purchase, and the present value of the tax on B's annuity is therefore £100.

The value of the tax which is paid respectively by A and by B, on the same sum of money which each has invested, namely, £3,333, is in both cases £100; the income tax is therefore, it is said, equitable—as its value is in these cases, as well as in all other cases of the same kind, proportional to the property from which it is derived.

That the tax is not proportional in the two cases to the interest or

* See Mr. Warburton's Evidence before the Income Tax Committee.

profit, is immediately proved; for in the first year, the interest of B's capital is £100, and the interest of A's capital is also £100; the tax therefore to be equitable ought to be the same: yet, in the case proposed, A is taxed in the year £10, while B is taxed only £3. The tax in that year on the profits of A is to the tax on the profits of B as $3\frac{1}{3}$ to 1; instead of being 1 : 1, as it should be to preserve the proportionality. *A fortiori*, the tax on the profit of A and of B ceases to be proportional to the profit in the second, third, and every subsequent year; for while the profit of A diminishes every year, as the property diminishes, B's profit, as well as his property, remains invariably the same. The tax is therefore not equitable, as it is not in proportion to the profit.

The illusion is created by leaving out the element of Time, and referring only to Property, which does not in itself, like interest, involve any relation to time. It is proved that the value of this tax which is collected from A in 12 years is the same as the value of the tax collected on B and his successors, for an unlimited time, for 20, 40, 60, for 120 years—or for all time. But the fact that the values of two taxes on two properties of the same value are the same does not justify the inference that the properties are taxed equitably; for in order to be equitable the tax must be the same in the same time [see Axiom]; if the property is taxed £1 in one year, it must be taxed £2 in two years, £3 in 3 years. To tax one property as much for its protection by the State in one year as another of the same value is taxed in three years, is not equitable. To be equitable, proportionality between the tax, the time, and the property must be preserved.

The same reasoning may be applied to Rent, Interest of money, and Insurance. Thus A purchases *three* farms; he pays for each farm the same sum, £6,000. To the Farmer B he lets his first farm on a 14 years' lease at the rate of £200 a year; Farmer C applies for the second farm on a 7 years' lease; A, employing the reasoning of the fallacy, may say, "Yes, the farm is worth the same money as the farm of B, and I will let it you on the same terms: he pays me £2,800 for it, and you shall have your farm for the same sum—namely, £400 a year." Again D may apply for the third farm, as a yearly tenant, and A, reasoning as before, may say, "I will let you this farm, which is of the same value as the farms of B and C, for the same sum—namely, £2,800, which you must pay at the end of the year." The Farmers would probably fail to see the equity of these proposals.

A may on the same grounds, having lent £1,000, at the rate of 5 per cent. per annum, to B, for 6 years, and received £300 for it, say to C, another borrower, who wants £1,000 for 2 years: "Yes, I will lend you the same sum as I have lent B, and for the same interest, namely, £300, which will in your case be £150 a-year. You will both thus pay me the same interest for the same principal." The interest, it is true, is in the same proportion to the capital; but the instant the element of time is brought into account, the illusion is dispelled. A asks C 15 per cent. *per annum*, for his money, in the latter case.

If the same tax is to be paid by one person in twelve years as is paid by another in twenty-four years, or for ever, it may be shown that the same premium should be paid to insure the same sum for one year, as is required to insure it for the whole term of life. A whole genus of fallacies may be invented, where the ratio is compound, by establish-

ing the proportionality in certain elements, and neglecting others which are overlooked by the mind. The fallacy ascribed to Zeno of Achilles and the tortoise, which Archbishop Whateley has adapted in his logic, is of this character. In both fallacies the illusion is created by the play on the same element; in both it is easy to prove that the contrary is true; in both it is found that few detect the logical error.

If the owner of one property cannot be taxed twice as much as the owner of another property of the same value, in the *same* time, neither can the holder of a temporary annuity be justly taxed to the same amount as he is in the first year, either during the second or any subsequent year; for the amount of property in the annuity constantly decreases. Thus, an annuity of £1000 for seven years—if the interest of money is 5 per cent. per annum—is worth £5786·373; the interest on which is £289·31865; a tax of 3 per cent. on the interest, or of ·15 per cent. ($\alpha = .0015$) on the principal, is £8·679.

		Tax fairly chargeable on Interest.	
		£	£
1st year.	Principal.....	5786·373	
	Interest	289·319	8·679
		6075·692	
	Deduct Annuity	1000·000	
2nd year.	Principal.....	5075·692	
	Interest	253·785	7·614

The equivalent *uniform* tax is £5·436, by Eq. 15.

SECTION VI.—*Taxes upon Life Annuities and on Life Interests in Rents from unfailing sources.*

Life annuities terminate, as well as annuities certain for terms; and they terminate inevitably within a limited time. Within that time the probability that the annuity will continue or end is expressed by Life Tables.

Case 1.—A has a life interest in an estate yielding a constant rent = I ; B has the absolute reversion. A certain tax per £1 = α , is levied annually on the property; what is the present value of A's share of the tax?

If the tax is assessed immediately before the rent is due, that is, upon the value of the first and of all subsequent rents, then the value of A's life interest at the age x is $= I \cdot \frac{N_x}{D_x}$; and $\alpha I \frac{N_x}{D_x}$ = the tax for a year chargeable on A. The same reasoning applies to the subsequent years, and it is found that in all cases at the age $x + n$, A's share of the tax is $\frac{\alpha I N_{x+n}}{D_{x+n}}$. But the present value at the age x , of £1 payable at the age of $x + n$, if a given person is alive at that age, is $\frac{D_{x+n}}{D_x} = \frac{v^{x+n} \cdot l_{x+n}}{v^x \cdot l_x} = \frac{l_{x+n}}{l_x} \cdot v^n$; where l_x represents the numbers in a life table at the age x , and l_{x+n} the numbers who attain the age $x + n$, $\frac{l_{x+n}}{l_x}$ the chance at the age x of attaining the age $x + n$.

If A is alive at the age	The present value of the tax payable then
x	is $a I \frac{D_x}{D_x} \cdot \frac{N_x}{D_x} = a I \frac{N_x}{D_x}$
$x + 1$	is $a I \cdot \frac{D_{x+1}}{D_x} \cdot \frac{N_{x+1}}{D_{x+1}} = a I \frac{N_{x+1}}{D_x}$
$x + 2$	is $a I \frac{D_{x+2}}{D_x} \cdot \frac{N_{x+2}}{D_{x+2}} = a I \frac{N_{x+2}}{D_x}$
$x + 3$	is $a I \cdot \frac{D_{x+3}}{D_x} \cdot \frac{N_{x+3}}{D_{x+3}} = a I \frac{N_{x+3}}{D_x}$
*	* * *
$x + n$	is $a I \frac{D_{x+n}}{D_x} \cdot \frac{N_{x+n}}{D_{x+n}} = a I \frac{N_{x+n}}{D_x}$

By taking the sum of these Equations the value of A's share of so much of the tax as is payable $(n + 1)$ times in n years, is found to be

$$C = a I \frac{N_x + N_{x+1} \dots + N_{x+n}}{D_x} = a I \frac{S_{x|n+1}}{D_x}$$

If $x + n$ is an age beyond the eldest in the Life Table, this becomes

$C = a I \frac{S_x}{D_x}$ = the present value of A's share of the tax, assessed and payable at the beginning of every year, on the value of the annuity including the first payment then due.

Then the uniform annual premium chargeable on A of which $a I \cdot \frac{S_x}{D_x}$ is the value, is found by proportion :

$$\frac{N_x}{D_x} : 1 :: a I \frac{S_x}{D_x} : a I \frac{D_x}{N_x} \cdot \frac{S_x}{D_x} = a I \cdot \frac{S_x}{N_x} = c_x$$

c_x = uniform annual tax payable by A during his life out of the life annuity, of which a payment is due at the age x .

The annual tax on the perpetuity, assessed in the same way, is $a I (1 + V_\infty) \therefore a I \left(1 + V_\infty - \frac{S_x}{N_x}\right)$ = the part of the uniform annual tax which is chargeable annually on the reversioner during the life of A. A table of these values is given in the evidence taken before the Parliamentary Committee on the Income Tax.

(2.) Let the tax now be assessed at the age x on the value of the annuity, of which the first payment is to take place at the age $x + 1$; then the present value of such annuity is $I \frac{N_{x+1}}{D_x}$, and the tax as-

assessed is $a I \cdot \frac{N_{x+1}}{D_x}$, which is due at the end of the year, whether A is alive or not. Thus at the age $x + n$, the tax then assessable and due at the age $x + n + 1$ on $I = 1$, is $a \frac{N_{x+n+1}}{D_{x+n}}$; the value of which at the age $x + 1$ immediately before the first payment is due, is $a \frac{N_{x+n+1}}{D_{x+n}} \cdot \frac{D_{x+n+1}}{D_{x+1}} = a \frac{N_{x+n+1}}{D_{x+1}} \cdot \frac{D_{x+n+1}}{D_{x+n}}$. A series of this kind may be constructed, but it does not exist in the Life Tables. Still $\frac{D_{x+1}}{D_x} \cdot \frac{N_{x+1}}{D_{x+1}} = v \frac{l_{x+1}}{l_x} \cdot \frac{N_{x+1}}{D_{x+1}} = \frac{N_{x+1}}{D_x}$; and it is an advantage if the

tax can be made payable only, if the tax-payer is alive, at the end of the year of assessment. Now $v \frac{N_{x+1}}{D_{x+1}}$, payable at the end of the year if A survive, is of the same value as $v \frac{l_{x+1}}{l_x} \cdot \frac{N_{x+1}}{D_{x+1}}$, certain.

And generally $\frac{N_{x+n+1}}{D_{x+n}} \cdot \frac{D_{x+n+1}}{D_{x+1}} = \frac{N_{x+n+1}}{D_{x+1}} \cdot \frac{D_{x+n+1}}{D_{x+n}}$.

Also $\frac{N_{x+n+1}}{D_{x+n+1}} \cdot \left(\frac{D_{x+n+1}}{D_{x+n}} \right) \frac{D_{x+n+1}}{D_{x+1}} = \frac{N_{x+n+1}}{D_{x+n+1}} \cdot v \cdot \left(\frac{l_{x+n+1}}{l_{x+n}} \right) \cdot \frac{D_{x+n+1}}{D_{x+1}}$.

If the payment of the tax is made contingent on the tax-payer at the age $x+n$ attaining the age $x+n+1$, then $\frac{l_{x+n+1}}{l_{x+n}}$ may be struck out of the last equation, which becomes $v \frac{N_{x+n+1}}{D_{x+1}}$. And

$C = a I v \frac{(N_{x+1} + N_{x+2} \dots + N_{x+n})}{D_{x+1}} = a I v \frac{S_{x+1:n}}{D_{x+1}}$ = the value of a tax at the rate of a in the £1 on the successive values of a life annuity, assessed at the beginning, payable at the end of every year for n years if the annuitant is alive; the valuation being taken at the age $x+1$, immediately before the annuity assessed at the age x is paid.

If $x+n$ exceeds the greatest age in the Life Table, $C = a I v \frac{S_{x+1}}{D_{x+1}}$.

And $C = a I v \frac{S_{x+1}}{N_{x+1}}$ = the equivalent uniform annual tax.

(3.) If the tax is made payable at the time it is assessed, age x , then $C = a I \cdot \frac{S_x}{D_x}$ = the present value of the tax.

And $C = a I \frac{S_{x+1}}{N_x}$ = the equivalent uniform annual tax, the first payment at the age x .

The composition of the absolute reversioner B under the three modes of assessment and valuation is:

$$(1.) \quad C = a I \left\{ \left(\frac{1+i}{i} \right)^2 - \frac{S_x}{D_x} \right\}$$

$$(2.) \quad C = a I \left(\frac{1+i}{i^2} - v \frac{S_{x+1}}{D_{x+1}} \right)$$

$$(3.) \quad C = a I \left(\frac{1}{i^2} - \frac{S_{x+1}}{D_x} \right).$$

The annual tax chargeable on the reversioner during A's life is under the three modes of assessment.

$$(1.) \quad C = a I \left(\frac{1+i}{i} - \frac{S_x}{N_x} \right) = a I \left(1 + V_\infty - \frac{S_x}{N_x} \right)$$

$$(2.) \quad C = a I \left(\frac{1}{i} - v \frac{S_{x+1}}{N_{x+1}} \right) = a I \left(V_\infty - v \frac{S_{x+1}}{N_{x+1}} \right)$$

$$(3.) \quad C = a I \left(\frac{1}{i} - \frac{S_{x+1}}{N_x} \right) = a I \left(V_\infty - \frac{S_{x+1}}{N_x} \right).$$

And if the tax of the absolute reversioner B (2) is paid by A from

his age $x + 1$, its amount at the end of the year in which A dies will be $a I \left(\frac{1}{i} - v \frac{S_{x+1}}{N_{x+1}} \right) \frac{N_{x+1}}{M_{x+1}}$.

The tax equitably chargeable in other cases in which more than one life is involved can be solved. Thus,

The tax on the value of an annuity on joint lives, is $a I A_{x,y}$
 $= a I \frac{N_{(x,y)+1}}{D_{x,y}}$ = tax chargeable on the holder of such an annuity in the year that the lives are of any age, x and y .

The tax chargeable in the year on an annuity to a life age y , after the death of a life age x :

$$a I (A_x - A_{x,y}) = a I \left(\frac{N_{x+1}}{D_x} - \frac{N_{(x,y)+1}}{D_{x,y}} \right)$$

The tax chargeable in the year on the holder of an annuity on the longest of two lives :

$$a I (A_x + A_y - A_{x,y}) = a I \left(\frac{N_{x+1}}{D_x} + \frac{N_{y+1}}{D_y} - \frac{N_{(x,y)+1}}{D_{x,y}} \right)$$

SECTION VII.—*Taxes upon Property in Life Incomes from Professions, Commerce, Trade, and Manufactures.*

The characteristic of this property is that it is inherent in man, and is the value of his services—of the direct produce of his skill and industry. In slaves it is vendible and transferable; in freemen it is inalienable; but is not the less on that account property, which in the early states of society is assessed and taxed in the form of personal services. It is combined with stock in all productions; and the proportion of the elements varies in every kind of product

The labour of the parents, and the expense of attendance, nurture, clothing, lodging, education, apprenticeship, practice, are investments of capital, at risk extending over many years; and the return appears in the form of the wages, salaries, incomes, of the survivors, commencing at various ages, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, and ages still greater; for the incomes in the higher professions increase probably up to the age of 50 or 55. The outgo increases from infancy up to a certain age; the earnings then commence, and ere long equal the outgo; they are subsequently in excess throughout manhood, and at advanced age decrease, until they are extinguished amidst the feebleness and infirmities of old age. The present value of the person's probable future earnings, *minus* the necessary outgo in realizing those earnings, is the present value of that person's services. Like capital invested in the soil, in the vintage, or in a commercial adventure, the capital invested in the life of man returns, in happy natures, profit of a hundred-fold; in other cases fifty, twenty, tenfold; in others it is barely returned; in some it is entirely lost, either by death, sickness, vice, idleness, or misfortune.

A large part of the profit of trade, and even of professions, is derived from external capital. I leave this for the moment out of consideration. And then, in large classes of cases, as well as in individuals, the incomes differ; but they will be found, on an average, to bear a very constant relation to the amount of capital invested in preparation—to the risk under which it is exposed—and to the time that it is under investment. The latter element is of greater importance than is generally imagined; for the fact that the earnings commence at

ages ranging from 15 to 45, will account for much of the difference in the incomes of different classes. This may be illustrated by cases of deferred annuities. Thus, if interest is reckoned at 5 per cent., £100 a-year from birth to the age of 15 is worth £148 a-year from that age to the end of life; £100 a-year from birth to the age of 25 is worth £362 a-year from that age to the end of life; £100 a-year from birth to the age of 30 is worth £540 a-year from that age to the end of life; £100 a-year from birth to the age of 40 is worth £1180 a-year from 40 to the end of life. Thus, capital yielding the same profit in different professions may, during the age of return, yield average incomes respectively of £100, £200, £300, £400, £500, £1000.

The following table has been calculated by the formula $\frac{N_{0|x}}{N_x}$ = the deferred annuity which a premium of £1 a-year from birth to the age x will provide from that age to the oldest age in the Life Table.

The Deferred Annuity which a Premium of £100 a-year will purchase if continued up to the Ages of 15, 25, 30, and 40 years respectively, allowing either 3 or 5 per cent. per Annum Interest.

[Results deduced from the New English Life Table.]

Age.	3 per Cent.	5 per Cent.
	£	£
15	91·42	148·36
25	202·75	362·10
30	287·12	539·72
40	563·36	1180·05

Thus the premium of £100 a year, allowing the rate of interest to be 5 per cent. per annum, provides deferred annuities of £148·36; £362·10, £539·72, and £1180·05, according as the premium is continued from birth to 15, 25, 30, or 40 years.

From the English Life Table we find the number of persons who live from birth through every year of age to the end of a century. Let the average wages, salary, or professional income, earned in the year of age x to $x + 1$ be represented by w_x ; then as P_x represents the numbers in the Life Table living through that year; $w_x P_x$ will be the sum of the wages; in like manner $w_{x+1} P_{x+1}$ will be the sum of the wages in the year of age $x + 1$ to $x + 2$; and so on to the end of the table, age w . Let this column be added up from the oldest age to the age x , and the sum be represented by W_x ; then W_0 against the age 0 is = the sum of the wages of the generation. As the sum of the column P_x in the Life Table is Q_0 = the total numbers living at all ages, to a given number of births, D_0 : it is evident that $\frac{W_0}{Q_0}$ = the

average annual earnings per head of the whole generation; and $\frac{W_0}{D_0}$ = the average earnings of each person from birth to the end of his life.

So if the average cost of maintenance of a child age 0 to 1 were known to be y_0 ; and of a person through any year of age x to $x + 1$ were y_x ; then the cost of maintaining P_x persons would be $y_x P_x$; and the sum of a column of such numbers from the end of the table to the

age x would be Y_x ; the cost of the maintenance of the generation would be Y_o . The difference between the wages and the cost of maintenance is $W_o - Y_o$; or the surplus of the earnings over the cost of necessary subsistence. $W_o - Y_o$ may be called the profit; as W_o represents the produce; Y_o the cost of production. Then $\frac{W_o - Y_o}{Q_o}$ = the annual profit per head; and $\frac{W_o - Y_o}{D_o}$ = the average aggregate gain on the life of each individual.

If we assume for a moment that the profit $W_o - Y_o$ is in the possession of an individual A; and is a transferable value; the price will depend upon the rate of interest (i) at which investments of the kind are made. Thus, if the rate of interest is 5 per cent. per annum, the annual revenue $W_o - Y_o$ will be worth 20 years' purchase. For in this case $\frac{W_o - Y_o}{i} = \frac{W_o - Y_o}{.05} = 20 (W_o - Y_o)$. The produce or income will be at the rate of $\frac{100 W_o}{20 (W_o - Y_o)} = \frac{5 W_o}{W_o - Y_o}$ per cent. on the capital; the expenditure or outgo $\frac{5 Y_o}{W_o - Y_o}$ per cent.; the profit $\frac{5 W_o - 5 Y_o}{W_o - Y_o} = \frac{5 (W_o - Y_o)}{(W_o - Y_o)} = 5$ per cent. on the capital invested.

If instead of the series P_x in the Life Table, the series $1 + \frac{i}{2} \cdot P_1$; $(1 + \frac{i}{2})^{x+1} P_x$ be employed; the present values at birth, and at any age x (1) of the future wages, (2) of the future cost of maintenance, are immediately obtained: the difference is the value of the future profit. And on dividing by the column $D_x = {}^v l_x$, the present value of the average wages, cost, and profit of a man of the age x is found.

The values of w_x and y_x can only be learnt by observation. And the actual wages of classes of men in different trades and professions, as well as the actual cost of education and maintenance, are *desiderata* in Statistics.

The Tables from which an extract is given at the end of this paper, have been framed from returns of the wages of agricultural labourers, with which I was some time ago favoured by Sir James Kay Shuttleworth, and from returns collected by witnesses before a committee of the House of Commons.

The cost of maintenance is an estimate. Instead of the series* P_x^1 , the series D_x has been used throughout, (Table VII.) which is equivalent to assuming that the wages and cost in the several years of age were equal in value to the sums in the columns w_x and y_x , paid down to or for each person at the precise age x . The character of the results is thus indicated with sufficient exactness for illustration and all practical purposes.

It will be seen that at the age 20, the value of an agricultural labourer's future wages is £482; that the value of the estimated cost of necessary maintenance is £248; that the net value of his services is therefore £234.

I have now discussed, in Part I. the general principles of a property-

* The above series, P_x^1 , is not in the Life Table, and I have only had it calculated at 3 per cent. interest, for Table VIII. in which it was used.

tax; and in Part II. the principles on which tables may be constructed for assessing the tax equitably.

In Part III., which I may, perhaps, be able to bring under the notice of the Society at some future time, I shall endeavour to show how, at the least expense and inconvenience, these principles can be applied practically to different kinds of property, in the possession of different classes of the community. In the meantime, I beg to refer, for an outline of this branch of the subject, to the draft Report of the Chairman (Mr. Hume) in the proceedings of the Committee of the House of Commons on the Income and Property-Tax.*

It may be sufficient to state here, that professional incomes fluctuate less than it is generally supposed; that in assessing the property-tax at the beginning of the year, it may be assumed that the income will remain uniform (it may be more or less, but in general this is the most probable hypothesis); subject to the chance of death, and the discount of money at such a rate of interest as will cover all other risks. The value of a professional income must be nearly equivalent to a life annuity, in which money is taken at some rate between 3 and 10 per cent. per annum. For the present, I propose to use a table which is based on the rate of 5 or 6 per cent. interest. And a sum must be deducted for the cost of subsistence.

TABLE IV.

Digest of Sir J. Kay Shuttleworth's Return of the Wages of the Best Class of Labourers in Norfolk.

Age.	Number of Labourers.	Earnings of Man.	Earnings of Wife and Children.	Earnings of Family, including Gleaning.
		£	£	£
17—20....	4	77	....	77
20—25....	14	374	7	381
25—30....	27	813	39	852
30—35....	37	1,160	137	1,297
35—40....	37	1,140	175	1,315
40—45....	37	1,164	237	1,401
45—50....	29	924	274	1,198
50—55....	19	581	134	715
55—60....	13	407	90	497
60—65....	4	126	31	157
65—70....	3	77	7	84
70—75....	2	36	4	40
75—80....	1	16	....	....
80—85....	....	....	....	....
85.....	....	....	....	....
Total.....	227	6,895	1,135	8,014

* See also the whole of the evidence of the several witnesses. An outline of a classification of property, and several numerical examples are given in my evidence. I take this opportunity of correcting an arithmetical error in one of the examples. For the three last lines at bottom of p. 217, Qu. 4958, read

$$\begin{array}{r}
 3)154,251 \\
 \hline
 \text{Value of Stock} \quad 51,417 \\
 \text{Deduct} \quad \quad \quad 500 \\
 \hline
 50,917 \text{ C's tax is } £50,917.
 \end{array}$$

TABLE V.

*Digest of the Return of Wages of Agricultural Labourers in Bedfordshire.
By Turner; (corrected by Pearse.)*

[From evidence before Parliamentary Committee of Inquiry into New Poor Law.]

Age.	Number of Labourers.	Earning of Labourers.
15—20	3	£ 32
20—25	7	144
25—30	13	291
30—35	12	280
35—40	7	201
40—45	14	360
45—50	6	113
50—55	3	48
55—60	2	34
60—65	4	68
65—70	3	62
70—75	3	30
75	1	3
Total	78	1,666

TABLE VI.

Of the Wages and of the Cost of Maintenance of Agricultural Labourers in England. (Extract from a Complete Table.)

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Age	Living at each Age,	Sum of the Living at each Age and upwards,	Expense of Maintenance per Annum for one Person,	Wages Earned per Annum by one Person,	Expense of Maintenance for all the Living in the year following the Age x ,	Wages Earned by all the Living in the year following the Age x , $w_x l_x$.	Expense of Maintenance for the whole of the Living at each Age x and upwards, Y_x .	Wages of all the Living at the Age x and upwards, W_x .	Net Profit = the Difference between the Income and Outgo, $(W_x - Y_x)$.
x .	l_x .	N_x .	y_x .	w_x .	$y_x l_x$.	$w_x l_x$.	Y_x .	W_x .	$(W_x - Y_x)$.
			£	£	£	£	£	£	£
0	513	20,961	7	....	3,591	....	268,539	420,488	151,949
5	372	18,848	7	....	2,604	....	253,741	420,488	166,747
10	355	17,029	8	....	2,840	....	241,008	420,488	179,480
15	346	15,272	12	12	4,152	4,152	224,501	415,249	190,748
20	335	13,561	15	23	5,025	7,705	201,945	386,913	184,968
25	321	11,914	15	29	4,815	9,309	177,240	344,124	166,884
30	307	10,337	15	31	4,605	9,517	153,585	297,143	133,558
35	291	8,834	15	31	4,365	9,021	131,025	250,519	119,494
40	275	7,410	15	31	4,125	8,525	109,665	206,375	96,710
45	257	6,071	15	31	3,855	7,967	89,580	164,866	75,286
50	237	4,826	15	31	3,555	7,347	70,905	126,271	55,366
55	215	3,685	15	31	3,225	6,665	53,790	90,900	37,110
60	189	2,660	15	31	2,835	5,859	38,430	59,156	20,726
65	156	1,780	15	29	2,340	4,524	25,215	32,008	6,787
70	118	1,074	15	21	1,770	2,478	14,625	13,807	— 818
75	79	560	15	16	1,185	1,264	6,915	4,359	— 2,556
80	44	239	15	4	660	176	2,100	378	— 722

The Table VI. is read thus : of 513 males born annually, 335 attain the age of 20 ; and the sum of the numbers who attain that and every subsequent birthday is 13,561 : the expense of bare maintenance in the year following is £15 (rather less than 6s. a week) ; the wages of one labourer in the same year are £23 ; the cost of maintaining the 335 is £5,025 ; their wages amount in the same time to £7,705 ; the cost of maintaining all at and above that age is £201,945, while their wages are £386,913 ; the difference or the net annual profit is £184,968.

TABLE VII.

(1.) *Money Value of a Man ; or a Table of the Value of the Future Earnings and of the Cost of Maintenance of an Agricultural Labourer. (Interest 5 per Cent.)*

Age.	Present Value of			Annuity Equivalent in Value to		
	Future Earnings,	Cost of Future Maintenance,	Excess of Earnings over Cost of Maintenance,	Future Earnings,	Cost of Future Maintenance,	Excess of Earnings over Cost of Maintenance,
	$\frac{W_x}{D_x}$	$\frac{Y_x}{D_x}$	$\frac{W_x - Y_x}{D_x}$	$\frac{W_x}{N_x}$	$\frac{Y_x}{N_x}$	$\frac{W_x - Y_x}{N_x}$
	£	£	£	£	£	£
0....	147·89	142·52	5·37	10·75	10·36	·39
5....	260·32	204·38	55·94	14·81	11·63	3·18
10....	347·88	231·01	116·88	19·84	13·17	6·67
15....	438·85	247·30	191·55	25·73	14·50	11·23
20....	482·06	248·47	233·59	29·10	15·00	14·10
25....	487·90	241·55	246·35	30·31	15·01	15·31
30....	474·35	233·19	241·16	30·53	15·01	15·52
35....	451·73	223·51	228·22	30·35	15·02	15·34
40....	423·71	211·69	212·02	30·02	15·00	15·02
45....	391·11	198·35	192·76	29·59	15·01	14·58
50....	350·64	182·27	168·37	28·78	14·96	13·82
55....	301·41	163·59	137·82	27·46	14·91	12·56
60....	238·29	141·08	97·22	24·76	14·66	10·10
65....	165·20	119·20	46·00	19·93	14·38	5·55
70....	97·09	96·32	·77	13·92	13·81	·11
75....	49·11	73·66	— 24·55	8·55	12·82	— 4·27
80....	10·25	51·27	— 41·01	2·20	11·00	— 8·80

TABLE VIII.

(1.) Values of the Future Wages of Agricultural Labourers of a high (A) and low (B) class.

(2.) Values of the Incomes of Persons in a Profession.

The values are given on the assumption that the interest of money is 3 per cent. The amount of the future income is the average amount received after the Ages in the first column.

Age.	Interest 3 per Cent.			Without Interest.		
	Value of Future Wages and Salaries.			Amount of Future Wages and Salaries.		
	Of Agricultural Labourers.		Of Persons in Professions on Moderate Incomes.	Of Agricultural Labourers.		Of Persons in Professions on Moderate Incomes.
	On High Wages.	On Low Wages.		On High Wages.	On Low Wages.	
11....	£ 542	£	£	£ 1,187	£	£
15....	607	456	....	1,195	886	....
20....	637	487	....	1,151	859	....
25....	627	481	5,329	1,068	796	10,462
30....	597	459	5,700	965	718	10,240
35....	556	424	5,951	856	629	9,844
40....	509	373	6,038	746	530	9,250
45....	456	312	5,932	636	427	8,451
50....	397	253	5,584	527	335	7,424
55....	330	201	4,933	416	256	6,140
60....	255	157	3,979	306	191	4,641
65....	172	116	2,718	198	135	2,961
70....	100	72	600	112	80	609
75....	49	32	....	52	34	....
80....	8	5	....	8	5	....

The table is read thus.—The value of the future earnings of (1) an agricultural labourer on good wages at the age of 25 is £627, (2) of an agricultural labourer on low wages £481, (3) of persons in a profession returning a moderate income of about £288 a year is £5,329; the average amount of wages after that age is £1,068, and £796, and £10,462 respectively.

Here $Q_x = 1 + \frac{i}{2} (v^{x+1} P_x + v^{x+2} P_{x+1} \dots + v^{w+1} P_w)$. And P_x the average number of persons living through the age x to $x+1$ by the Life Table.

W_x is obtained from the series Q_x by multiplying the several terms by $w_x, w_{x+1} \dots$.

Then $\frac{W_x}{D_x}$ = the present value of the wages.

The values in Table VIII. are given on the extreme hypothesis that the wages are as certain to be paid as Government Life Annuities at 3 per cent. interest. Compare these values with those in Table VII., where the interest is 5 per cent.